FOOD MANUFACTURE

Incorporating Food Industries Weekly

A PUBLICATION OF THE LEONARD HILL TECHNICAL GROUP 324 APRIL 1, 1957

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APR 22 1957

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Biscuit	Biscuits (all types).	**'Carameleff'**	Caramel desserts, cakes, fillings, icings, fondants, ice-cream (imparts the old-fashioned true 'burnt sugar' flavour).

Clark's Caramel, Sugars, and Syrups—made specially for the Food, Sugar Confectionery, and Bakery Trades—are distributed by the Industrial Products Division of Brown & Polson Ltd.

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MSB binds rusk and seasoning into an integrated whole with the meat. Texture is completely even and consistent from chopping to chopping.

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- **enables equal parts of meat and fat to be used because it is non-glutinous**
- **improves colour and flavour**
- **works fast, and cuts curing time for cooked meats by a third**

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Index to ADVERTISERS

	Page
Abbott & Co. (Newark), Ltd.	xcv
Abix (Metal Industries), Ltd.	lxx
Acalor Ltd.	Mar.
A.C.V. Sales, Ltd.	lxxiii
Advita Ltd.	Mar.
Agricultural & Chemical Products Ltd.	cvii
Airguard, Ltd.	Feb.
Albro Fillers & Engg. Co., Ltd.	lxxvi
Alfa-Laval Co., Ltd.	xiii
Alite Machines, Ltd.	xcviii
Allen, Stafford, & Sons, Ltd.	lv
Angel Warehouses Co., Ltd.	Feb.
Anhydro, A/S	Jan.
Ascot Gas Water Heaters Ltd.	Jan.
Associated Metal Works, Ltd.	civ
Astra Chemicals, Ltd.	Dec.
Auto Wrappers (Sales), Ltd.	cii
Bacon, W. C., & Co., Ltd.	Mar.
Baldwin Instrument Co., Ltd.	Dec.
Barron, W. S., & Sons, Ltd.	xcvi
Barry Wehmiller Machinery	xxxi
Bear Honey Co., Ltd.	xcvi
Beddington Nut & Produce Co., Ltd.	civ
Begg, Cousland & Co., Ltd.	xcvi
Bellingham & Stanley Ltd.	cviii
Benjamin Electric, Ltd.	lix
Bennett Sons & Shears, Ltd.	iv
Betts & Co., Ltd.	liv
Bliss, E. W., (England), Ltd.	xxiv
Boehm, Fredk., Ltd.	xxxvi
Boulton, William, Ltd.	Feb.
Bowater-Eburite, Ltd.	Dec.
Bowater Sales Corpn., Ltd.	Jan.
Bramigk & Co., Ltd.	x
Bramwell, S., & Co., Ltd.	lvi
Brierley, Wm., Collier & Hartley, Ltd.	lxxxiv
British American Product Co. Ltd.	Jan.
British Belting & Asbestos, Ltd.	Mar.
British Brehmer, Ltd.	Nov.
British Ceca Co., Ltd., The	xcviii
British Celanese, Ltd.	Mar.
British Cellophane, Ltd.	Mar.
British Electrical Development Association	xl
British Hydrological Corporation	Mar.
British Rayophane, Ltd.	lxxviii
British Road Services, Ltd.	Oct.
British Sidac, Ltd.	liii
British Soya Products, Ltd.	Mar.
British Thomson-Houston Co. (Rugby)	Feb.
British Wedge Wire Co., Ltd.	Jan.
Broadbent, Thomas, & Sons, Ltd.	Mar.
Brown & Forth, Ltd.	Mar.
Bryan, Wm., Ltd.	lxxiv
Bush, W. J., & Co., Ltd.	xxi
Butterfield, W. P., Ltd.	xiv
Butterley Co., Ltd.	Mar.
B X Plastics Ltd.	xcix
Calfos, Ltd.	Mar.
Cambridge Instrument Co., Ltd.	vi
Canning Town Glass Works, Ltd.	cii
Cashmore, John, Ltd.	civ
Cassidy, Peter, Ltd.	cviii
Chambon, Ltd.	Jan.
Clark-Built, Ltd.	Mar.
Clark, George, & Co., Ltd.	Cover i
Clark, T. & C., Ltd.	lvi
Coates Bros. Inks, Ltd.	Mar.
Cohen, George, Sons & Co., Ltd.	cvi, cvii
Colt Ventilation, Ltd.	xv
Commer Cars, Ltd.	xvi
Compressed Paper Packing, Ltd.	Mar.
Cona Coffee Machine Co.	ciii
Confectioners' Vegetables Colour & Fruit Essences Co., Ltd.	cviii
Cooks, E., Packers, Ltd.	Jan.
Cooper McDougall & Robertson, Ltd.	xxxviii
C.P. Equipment, Ltd.	Mar.
Craigmillar & British Creameries, Ltd.	li
Crofts (Engineers), Ltd.	lxxi
Crompton Parkinson, Ltd.	Feb.
Crookes Laboratories, Ltd.	Jan.
C.S.A. Industries, Ltd.	Nov.
Cuxson Gerrard & Co., Ltd.	Mar.
Dale, John, Ltd.	Mar.
Dalmas, Ltd.	ciii
Diagraph Stencil Machine Co., Ltd.	xcvi
Danks, Edwin, & Co., Ltd.	xviii
Davey, Paxman, & Co., Ltd.	lxxvii
Davis, Leon, & Co.	Feb.
Dawson Bros., Ltd.	Mar.
Demby, Hamilton, & Co., Ltd.	Feb.
Dewey & Almy, Ltd.	ci
Daniels, S., & Co., Ltd.	xcviii
Dick, R. & J., Ltd.	xcix
D.M.P. Sales, Ltd.	lxvii
Dodge Bros., (Britain), Ltd.	Dec.
Dodman, Alfred, & Co., Ltd.	liv
Donovan Electrical Co., Ltd.	lxxiv
Drakesons	cvii
Drayton Regulator & Instrument Co.	xxxvii
Duche & Knight, Ltd.	Dec.
Duche, T. M., & Sons, Ltd.	xciv
E.C.D. Co., Ltd.	Dec.
Edible Oil & Fat Refineries, Ltd.	Oct.
Eimco (Gt. Britain), Ltd.	Dec.
Electropower Gears, Ltd.	lxiv
Electrolux, Ltd.	Oct.
Electrothermal Engg. Ltd.	Oct.
Enamelled Metal Products Corpn. (1933), Ltd.	Mar.
English Electric Co., Ltd.	Dec.
English Grains Co., Ltd.	Oct.
Evan, Norman, & Rais, Ltd.	Mar.
Escher Wyss, Ltd.	Mar.
Evans, Wm., Co., Ltd.	lvii
Factory Equipment Exhibition	lxxxix
Felber Jucker & Co., Ltd.	lxxviii
Fenner, J. H., & Co., Ltd.	lxii
Fisher's Foils, Ltd.	I
Fison, Edward, Ltd.	xxii
Fisons Milk Products Ltd.	v
Flexibox, Ltd.	Mar.
Flexile Metal Co., Ltd.	xlvi
Follsain-Wycliffe Foundries, Ltd.	Mar.
Foodtech, Ltd.	iii
Foster Instrument Co., Ltd.	ci
Fox, Samuel, & Co., Ltd.	Mar.
Fraser, J., & Son, Ltd.	Mar.
Fuller Horsey, Sons & Cassell	civ
Gardener, Wm., & Sons (Glos.), Ltd.	Nov.
Gas Council	Cover iv
General Electric Co., Ltd.	xxxii
Gosheron, John, & Co., Ltd.	lxiv
Greening, N., & Sons, Ltd.	Mar.
Gunson, R. W., (Seeds), Ltd.	Mar.
Hannover Fair	Mar.
Hanovia, Ltd.	lxxxvi
Hamburger, M., & Sons	xcviii
Harvey, G. A., & Co. (London), Ltd.	lxviii
Havinden, G., Ltd.	Cover i
Hawker & Co.	Mar.
Hesser, F. R.	Jan.
Heston Equipment Co., Ltd.	Cover iii
H.I Engg. Co. (Hull), Ltd., The Thomas	Mar.
Hodgkinson, James, (Salford), Ltd.	xcvii
Honeywell-Brown, Ltd.	Jan.
Honeywell & Stein, Ltd.	Mar.
Hopkinson, Ltd.	Mar.
Howard Pneumatic Engg. Co., Ltd.	lxviii
Howorth, James, Ltd.	xliv
Hunt, John, (Bolton), Ltd.	lxx

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Index to ADVERTISERS

	Page
Imperial Chemical Industries, Ltd.	xi, xxiii, xxv, lxix, xci
Incinerator Co., Ltd.	c
Isopad, Ltd.	Jan.
Jackson, J. G., & Crockatt, Ltd.	c
Jenkins, Robert, & Co., Ltd.	Mar.
Jenner, A. & C., Ltd.	vii
Johnson, A., & Co., (London), Ltd.	lxv
Kek, Ltd.	Nov.
Kellie, R., & Son, Ltd.	lxxxvii
Kemball, Bishop, & Co. Ltd.	Jan.
Key Glassworks, Ltd.	Mar.
Kestner Evaporator & Engg. Co., Ltd.	Mar.
Kimpton Bros., Ltd.	Dec.
Kork-n-Seal, Ltd.	xxxix
Lacy Hulbert & Co., Ltd.	Dec.
Lambert, L., & Co., Ltd.	
Lautier Fils Ltd.	xliii
Lawton (Successors), Ltd.	xcvii
Loders & Nucoline, Ltd.	lxxxviii
London Fumigation Co., Ltd.	xcv
London Oil Corporation, Ltd.	cii
McGraw Hill Publishing Co.	Mar.
Magnetic Valve Co., Ltd.	Nov.
Maitlands (Metal Works), Ltd.	Mar.
Manbre & Garton, Ltd.	Mar.
Manufacturers Equipment Co., Ltd.	xc
Mather & Platt, Ltd.	lxxxv
May and Baker, Ltd.	Mar.
Measurement, Ltd.	xxviii
Megator Pumps and Compressors, Ltd.	xxx
Metaducts, Ltd.	xlviii
Metalfiltration Co., Ltd.	Mar.
Metal Box Co., Ltd.	xix, xxv
Metal Closures, Ltd.	Mar.
Metal Propellers, Ltd.	Feb.
Metalrax (Conveyors), Ltd.	Jan.
Milk Products (N.Z.), Ltd.	Mar.
Minnesota Mining & Mnfg. Co., Ltd.	xxxv
Mitchell Engg., Ltd.	Dec.
Mitchell, L. A., Ltd.	Mar.
Mono Pumps, Ltd.	Mar.
Monsanto Chemicals, Ltd.	Cover ii
Morton, Robert, & Co., Ltd.	Dec.
Mountain, A. & F., Ltd.	lxxxvi
National Glass Works (York), Ltd.	xx
Negretti & Zambra, Ltd.	Mar.
Nipa Laboratories, Ltd.	Feb.
Norman Engg. Co.	lxxvi
Oppenheimer Casing Co. (U.K.)	xii
Ormerod Engineers, Ltd.	Mar.
Ova Fruit Products Company	lxxviii
Packaging Exhibition	Jan.
Padley & Venables, Ltd.	Feb.
P.A.M., Ltd.	c
Paterson Hughes Engg. Co., Ltd.	xlii
Payne, P. P., & Sons, Ltd.	Jan.
Pearlite Box Co., Ltd.	Jan.
Permali, Ltd.	lxxxiii
Permoglaze, Ltd.	Mar.
Permutit Co., Ltd.	xxvii
Peters, G. D., Ltd.	lxxxiv
Pilkington Bros., Ltd.	Mar.
Planty & Son, Ltd.	lxxx
Polak & Schwarz (Eng.), Ltd.	Mar.
Pontifex, H., & Sons, Ltd.	iv
Porteus, G., & Sons, Ltd.	xcii
Potter, F. W., & Soar, Ltd.	civ
Premier Filterpress Co., Ltd.	xciv
Pressoturn, Ltd.	Nov.
Pulsometer Engg. Co., Ltd.	cviii
Purdy Machinery Co., Ltd.	lxxxii
Pye, W. G., & Co., Ltd.	Mar.
Ransomes Sims & Jefferies, Ltd.	Mar.
Rayner & Co., Ltd.	Feb.
Reads, Ltd.	Jan.
Redler Conveyors, Ltd.	Nov.
Reed Corrugated Cases, Ltd.	xlix
Renold Chains, Ltd.	lxxxi
Rhoden & Partners, Ltd.	Mar.
Roche Products, Ltd.	ix
Rose, Downs & Thompson, Ltd.	Mar.
Rubber Improvement, Ltd.	Nov.
Rubery Owen & Co., Ltd.	Jan.
Ruislip Distributing Co., Ltd.	Nov.
S.A. International Machinery Corpn.	Feb.
Salisbury Precision Engg. Co., Ltd.	lxxix
Sanders, H. G., & Son, Ltd.	xlvii
Saunders Valve Co., Ltd.	Mar.
Sauven Perforating Machine Co.	Dec.
Schimmel Boehm, Ltd.	lxvi
Scott-Reitz, Ltd.	xcii
Semtex, Ltd.	xvii
Senior Economisers, Ltd.	Mar.
Shell Chemical Co., Ltd.	Dec.
Shuttle, E. & Co., Ltd.	Dec.
Sig Wrapping Machines, Ltd.	Jan.
Simon, Henry, Ltd.	lxxv
Skerman, C., & Co., Ltd.	cvii
SMALL ADVERTISEMENTS	cv-cvii
Smith & McLaurin, Ltd.	Mar.
Soflor, Ltd.	Mar.
Spencer-Bonecourt-Clarkson, Ltd.	lxxx
Spencer Hopwood, Ltd.	lxxxii
Spesco Developments, Ltd.	xciii
Stacey, Frank, & Co., Ltd.	Dec.
Stainless Steel Vessels (London), Ltd.	viii
Star Welding, Ltd.	Feb.
Steel Co. of Wales, Ltd., The	lx, lxi
Stelcon (Industrial Floors), Ltd.	lxiii
Stevenson & Howell, Ltd.	Mar.
Sturge, J. & E., Ltd.	xxxiv
Sunvic Controls, Ltd.	Jan.
Taylor Rustless Fittings Co., Ltd.	Mar.
Technoexport	Jan.
Telegraph Construction & Maintenance Co., Ltd.	xxix
Thames Board Mills, Ltd.	Mar.
Thomas, Richard & Baldwins, Ltd.	Feb.
Trapow, D., & Co., Ltd.	Feb.
Tweedy, George, & Co., Ltd.	Mar.
Union Food Machinery and Equipment, Ltd.	cii
United Glass Bottle Manfrs., Ltd.	xlv
United Indigo & Chemical Co., Ltd.	Nov.
United Steel Companies, Ltd.	Mar.
United Wire Works, Ltd.	Dec.
U.S. Autowash, Ltd.	Mar.
Valrecchio, s.p.a.	Mar.
Venesta, Ltd.	Mar.
Vickerys, Ltd.	xciv
Visco Engg. Co., Ltd.	Dec.
Viscose Development Co., Ltd.	lviii
Viskase, Ltd.	Mar.
WAECO, Ltd. (Fumite Division)	c
Walker, Crosweller & Co., Ltd.	Mar.
Wallach Bros., Ltd.	Jan.
Warwick Production Co., Ltd.	xxxiii
Webster, Isaac, & Sons, Ltd.	Mar.
Webster, Ridgway, & Partners, Ltd.	xciii
Weir, G. & J., Ltd.	lxxii
Wetter, J. C., & Co., Ltd.	Mar.
White, Thomas, & Sons, Ltd.	Jan.
Whittaker, Arthur	cvii
Willcox, W. H., & Co., Ltd.	xli
Williams (Hounslow), Ltd.	Mar.
Yale & Towne, Ltd.	Aug.
York Shipley, Ltd.	Mar.
Yorkshire Engineering & Welding Co., Ltd.	Sept.
Youngman, W. C., Ltd.	iii

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A. **Temperature measurement and Control**

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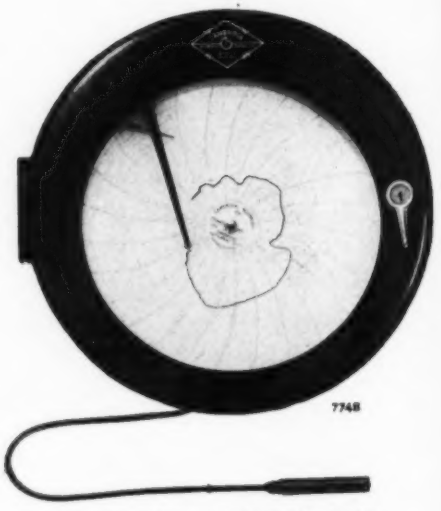

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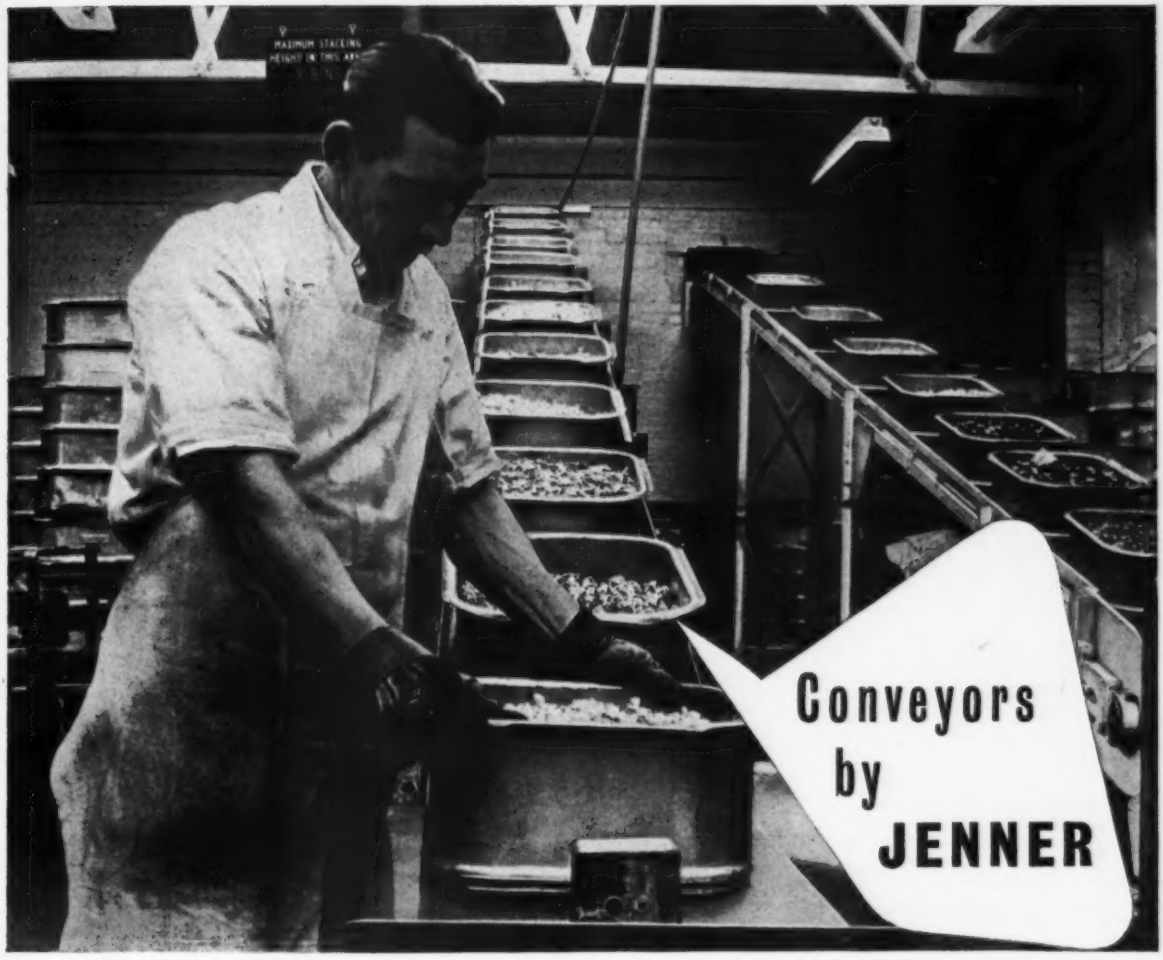

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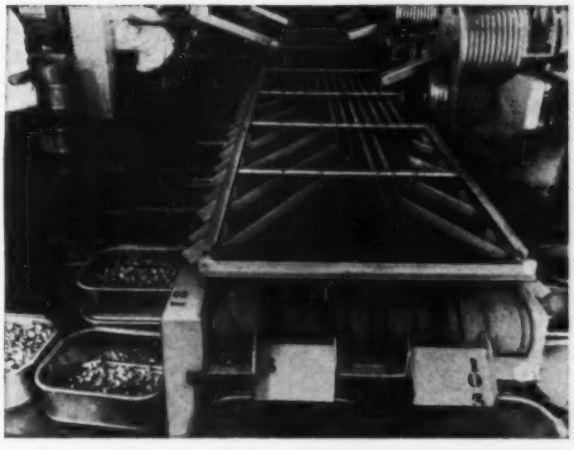

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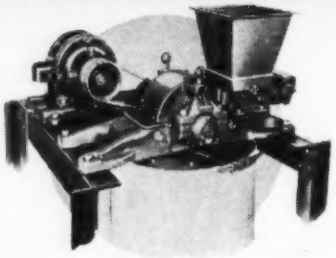

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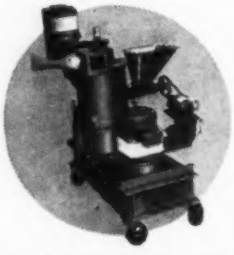

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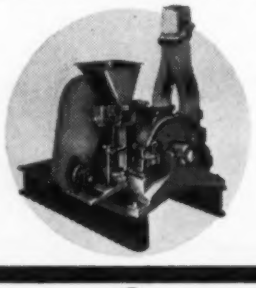

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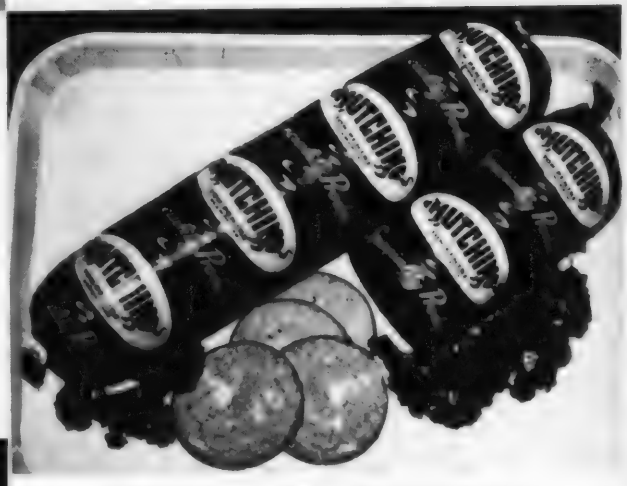

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This new centrifuge is designed for the rigid demands of the chemical and process industries —all liquid contact parts are of stainless steel— Clarified liquid is discharged under pressure giving the advantages of a closed system—It is ideally suited for the clarification of:— beer, beer-wort, wine, molasses, caustic lye, fruit juice, anti-biotics, etc.

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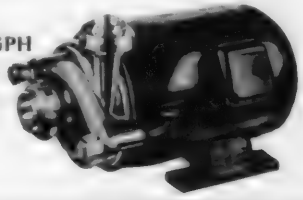

PROCESS ENGINEERING DIVISION
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Smee's DL370

Illustrated: 1500 gallon Single Compartment Stainless Steel Milk tank on Thorneycroft chassis.

For good Deportment

(or first-class carriage)

The word 'deportment' was on its way out when Road Tanks came in; it has about it a genuine flavour of Jane Austen, poker backs, and copperplate handwriting. We think the schoolboy's version (in brackets) has points.

'First-class carriage' is what Butterfields provide for valuable liquid foodstuffs in bulk. Butterfield Road Tanks are fabricated to specification in Stainless Steel, Mild Steel, or Aluminium, with the necessary insulation for ensuring constant temperature.

It was Butterfields who originated the particularly stable 'girder-type' mounting, for Tanks on conventional chassis: for tractor/trailer assemblies the tank can be stepped to preserve the line, clear the articulating gear and give low centre of gravity.

Butterfield **ROAD TANKS**

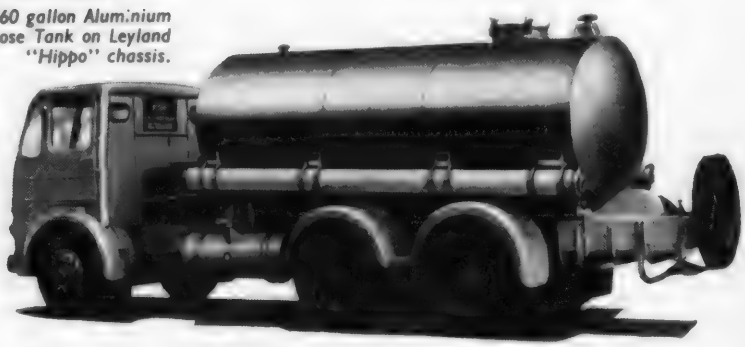
IN

STAINLESS STEEL

MILD STEEL

& ALUMINIUM

Right: 1760 gallon Aluminium Glucose Tank on Leyland "Hippo" chassis.



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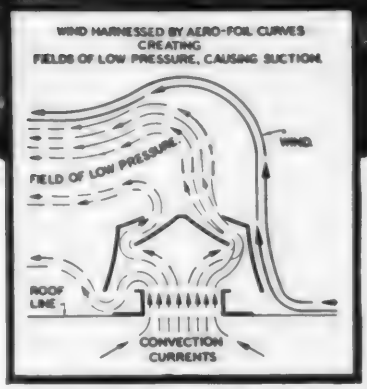
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Above is a sectional view of the Colt SR type ventilator often used in bakeries. Without any of the disadvantages of noise, wear and tear, maintenance or running costs, one of these ventilators can provide continuous positive extract at a rate of 400,000 cubic feet per hour.

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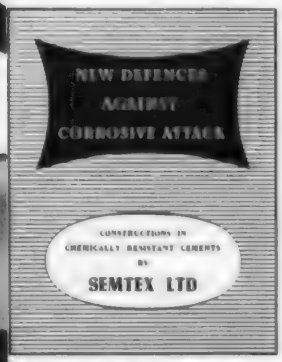

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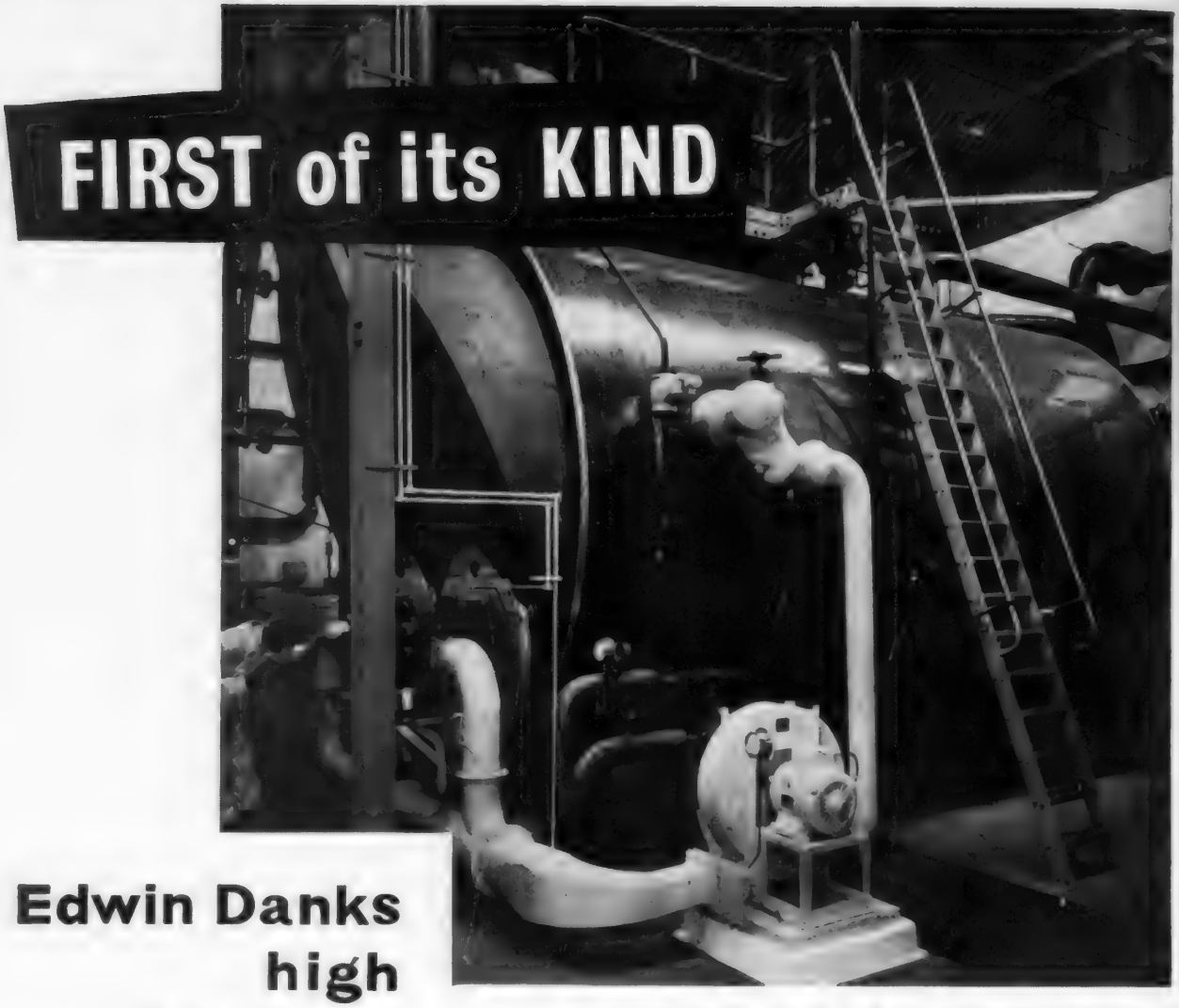

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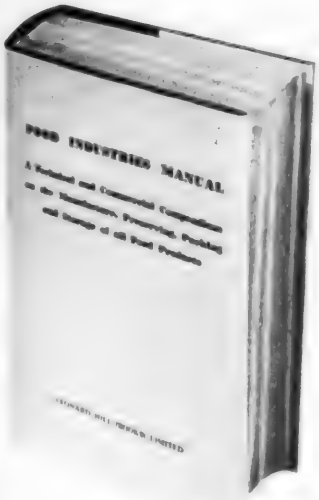

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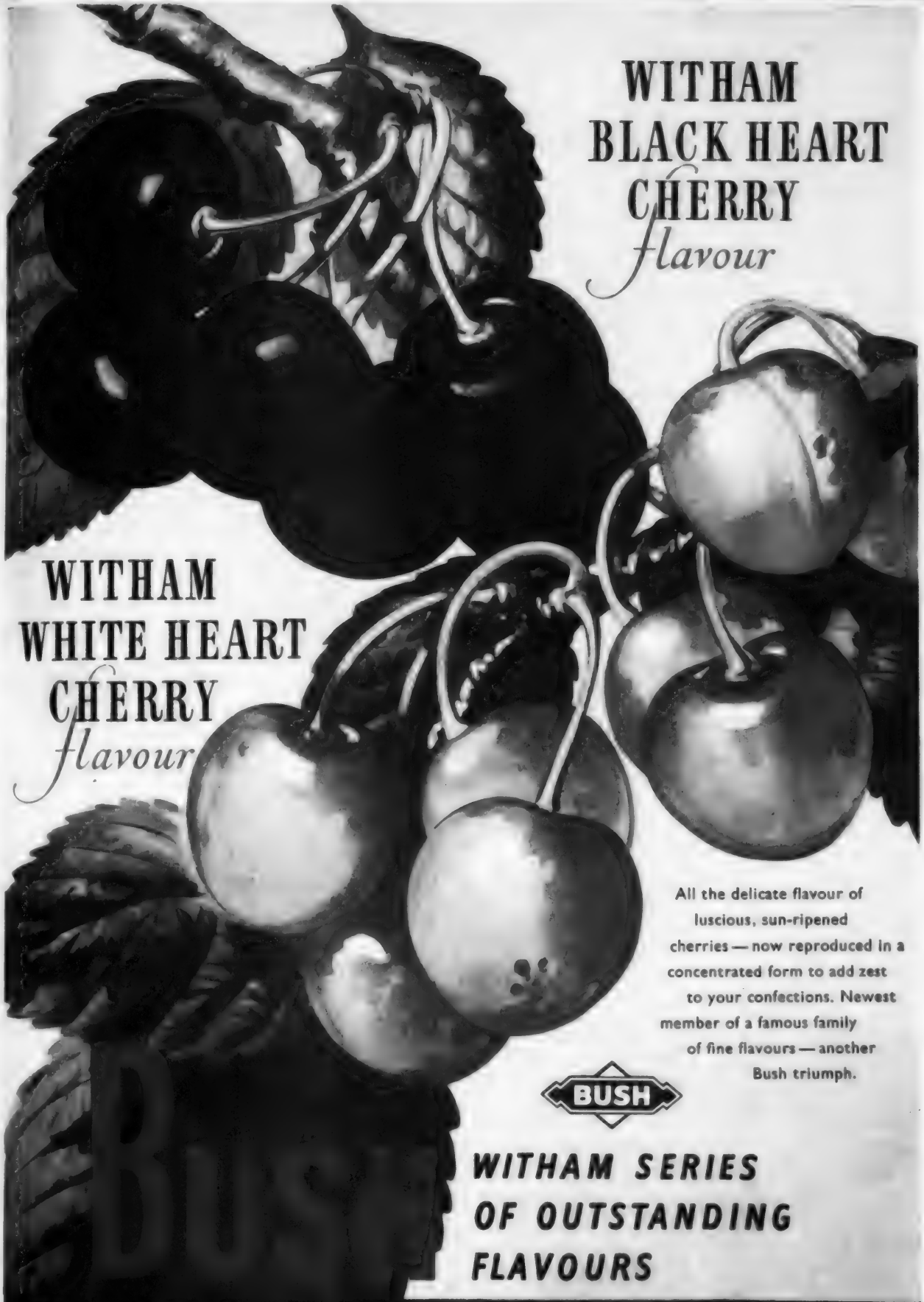
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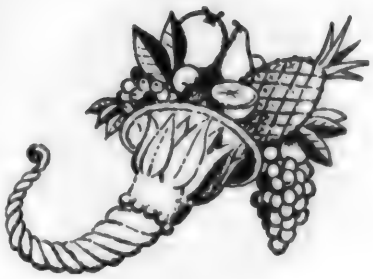

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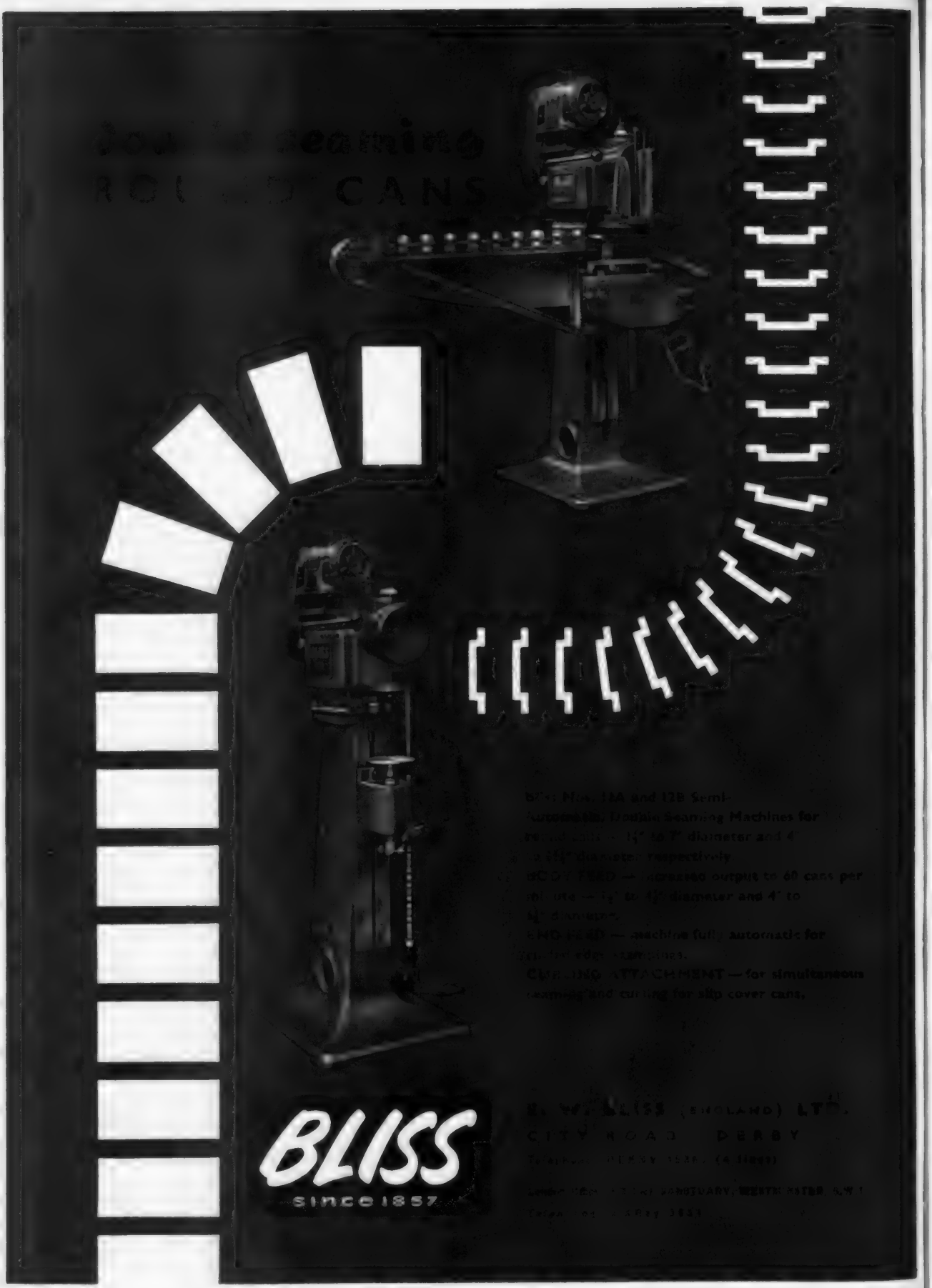
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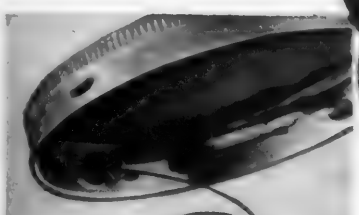
tinplate screw cap for pickle jars

by Metal Box



WATCH THE DANGER SPOTS

Here is a tinplate cap made with all the familiar cut edges and sharp bends. Its internal coating of acid-resisting lacquer has been split and cracked during manufacture, and that's where corrosion has started.

Metal Box have overcome corrosion, the worst enemy of all tinplate pickle caps. This new style cap has two distinct advantages over previous types—it is made by a new manufacturing process which minimises damage to the internal coating, and the coating itself is tougher, more elastic, more resistant to pickle acids. The design eliminates the knurl completely, and the smoothly operating thread does not disturb the coating when the cap is screwed on to the bottle. All the danger spots where corrosion normally starts are completely absent. The wad rotates freely in the cap to ease removal, and the whole cap looks clean and stays clean. This new Metal Box pickle cap combines the strength and low cost of a tinplate cap, yet is non-corrosive too!

A twist - it's off

The smooth thread makes the Metal Box cap so easy to remove. Available to fit the standard 58 neck ring.

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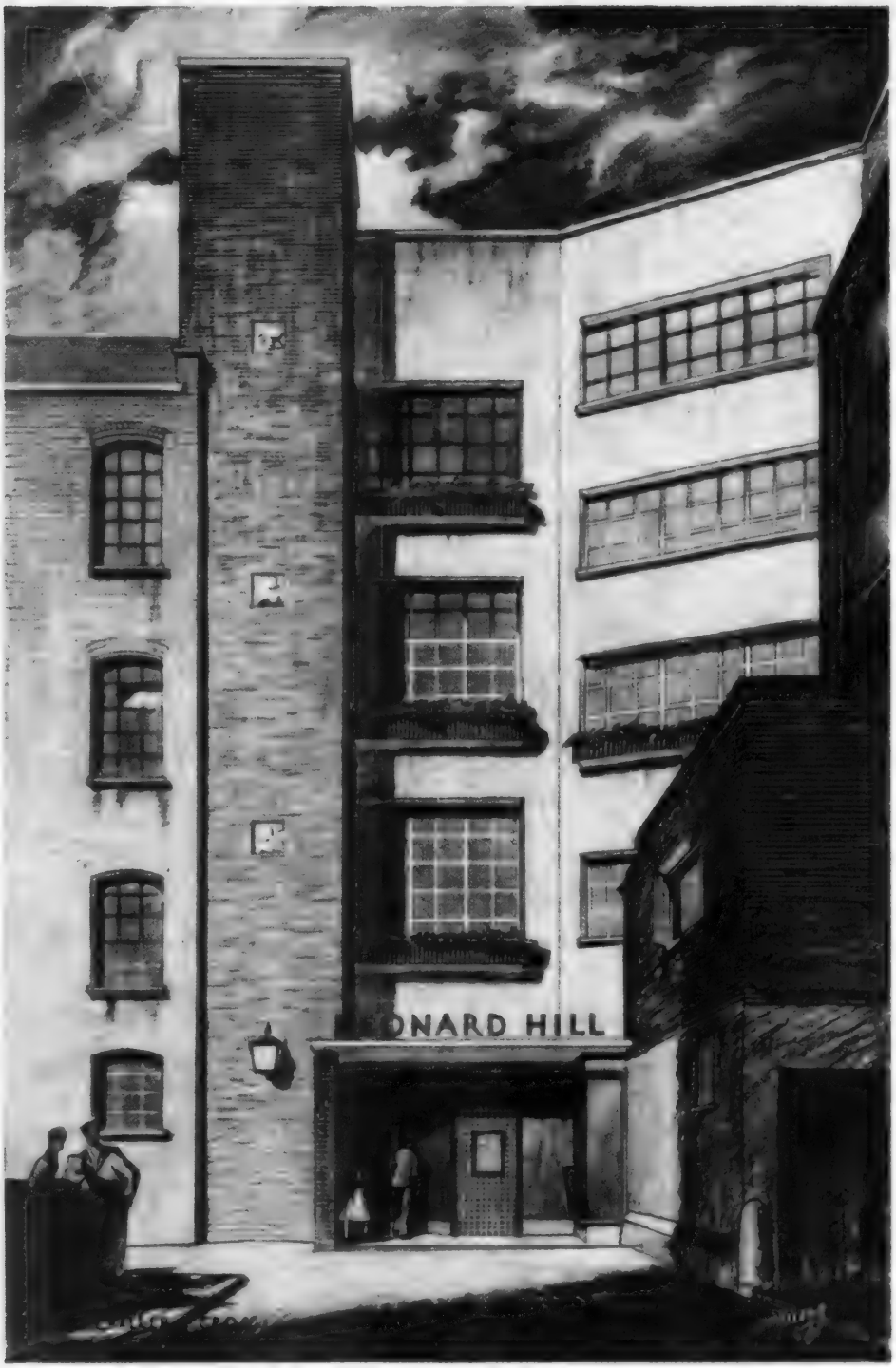

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This is the new frontage of Stratford House, Eden Street, London, N.W.1, headquarters of the Leonard Hill Technical Group. The reconstructed building now provides more than 22,000 square feet of office space to accommodate the world-wide and expanding activities of the Group, which now publishes 17 technical journals and many scientific and technical books. The water colour drawing is by J. M. Harvey, the well-known Royal Academy exhibitor of architectural perspectives.

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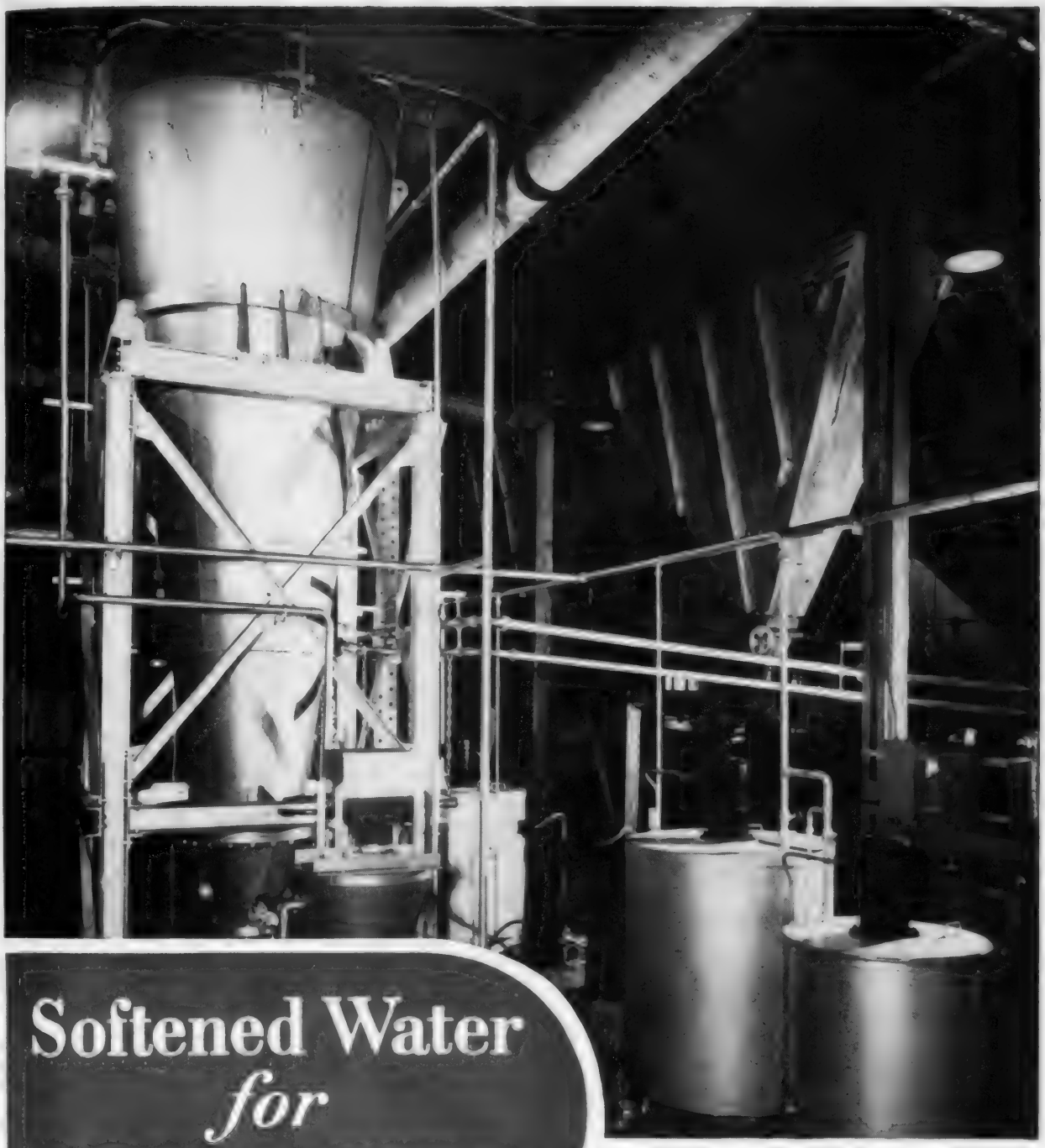

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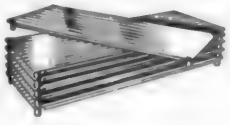

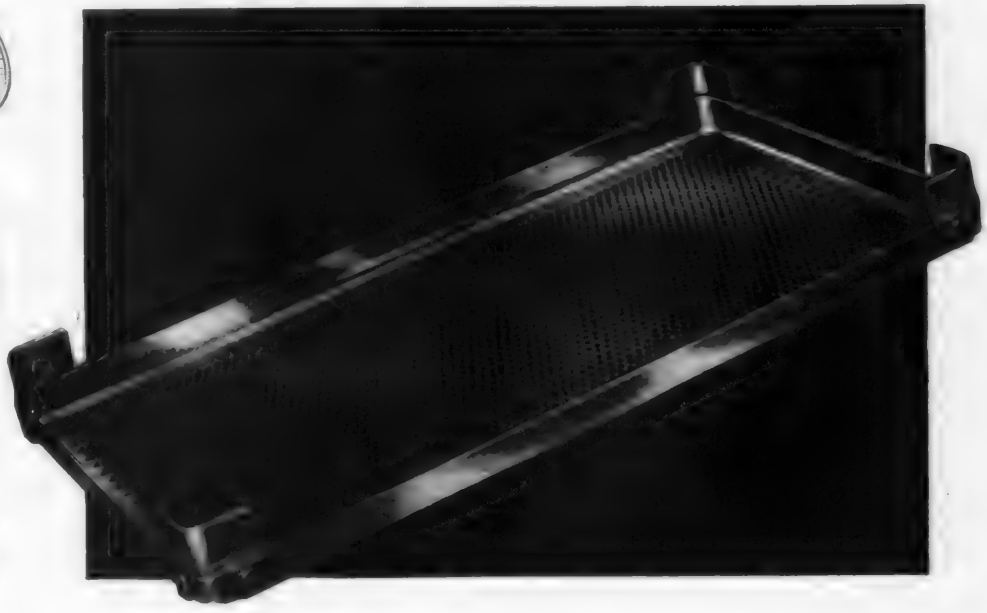

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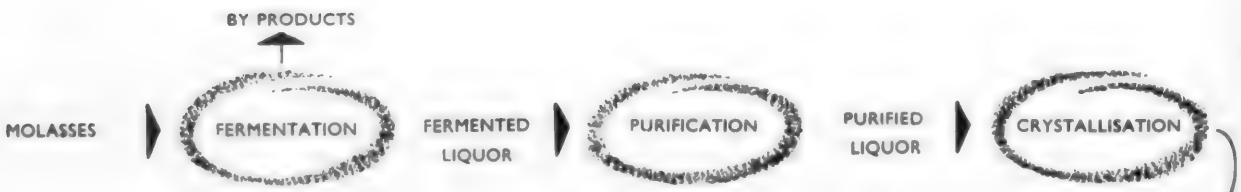

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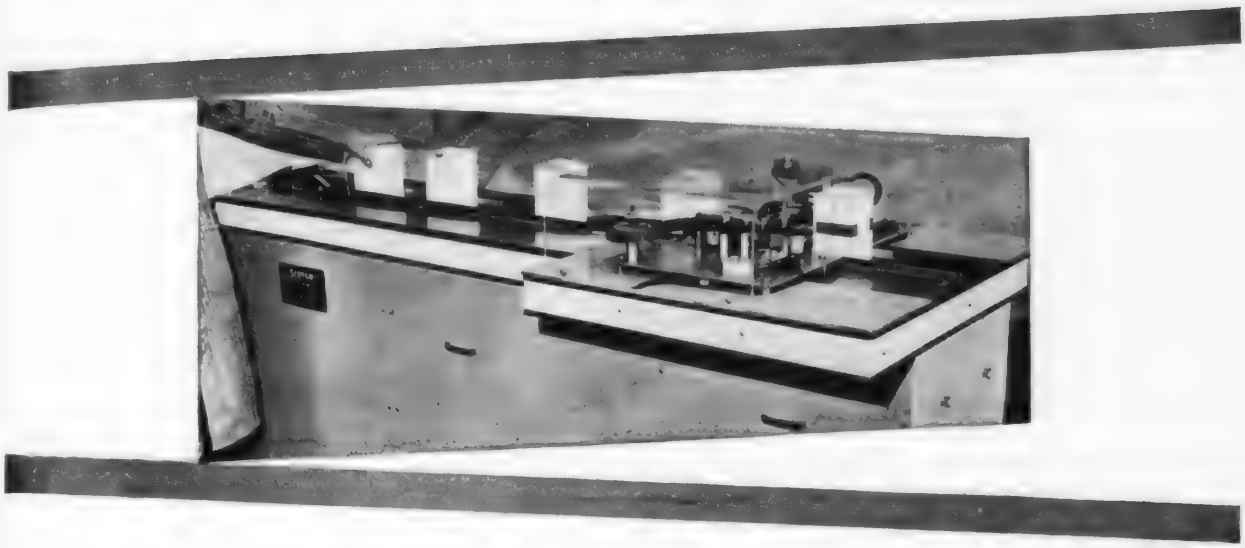

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"Mr. M.... informed me he has had an installation of Drayton-Armstrongs running for twenty years now, some thirty D/A 200's. This was the first D/A job he did and to keep his eye on the condensate he fitted the condensate return to the hot well at a very prominent position. He sees it frequently and it is running exactly as the day he started it up with no sign of steam in it. Not one of these traps have been opened in the twenty years. He says no salesman in the world could persuade him to fit any other trap."

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Drayton-Armstrongs stand in a class by themselves for long life and trouble-free operation.... No outlay on servicing, no renewals, no loss in efficiency though nothing has had to be paid out on maintenance. The unique free-floating lever system, combined with an exceptionally high material and manufacturing specification, ensure a trapping performance over the whole of the long life of the Drayton-Armstrong which cannot be bettered by any other trapping system.

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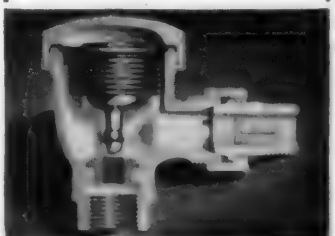

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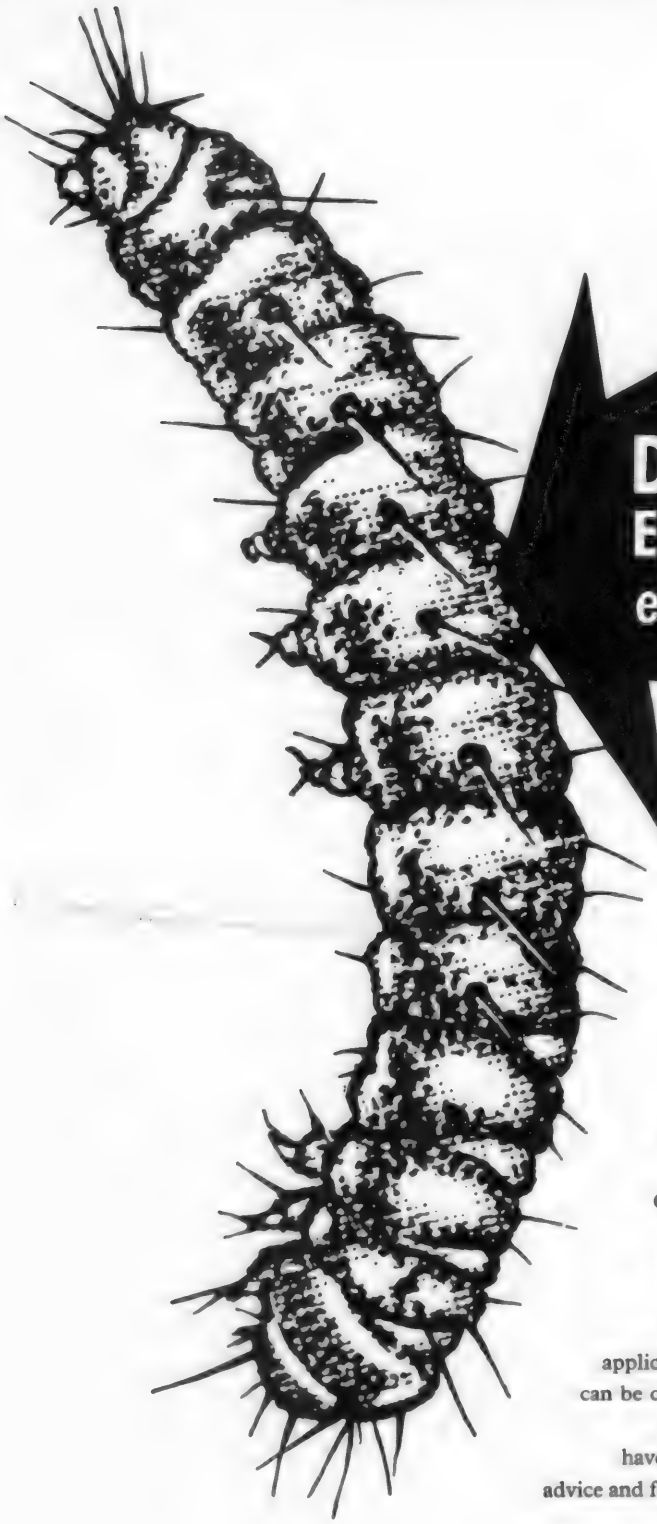

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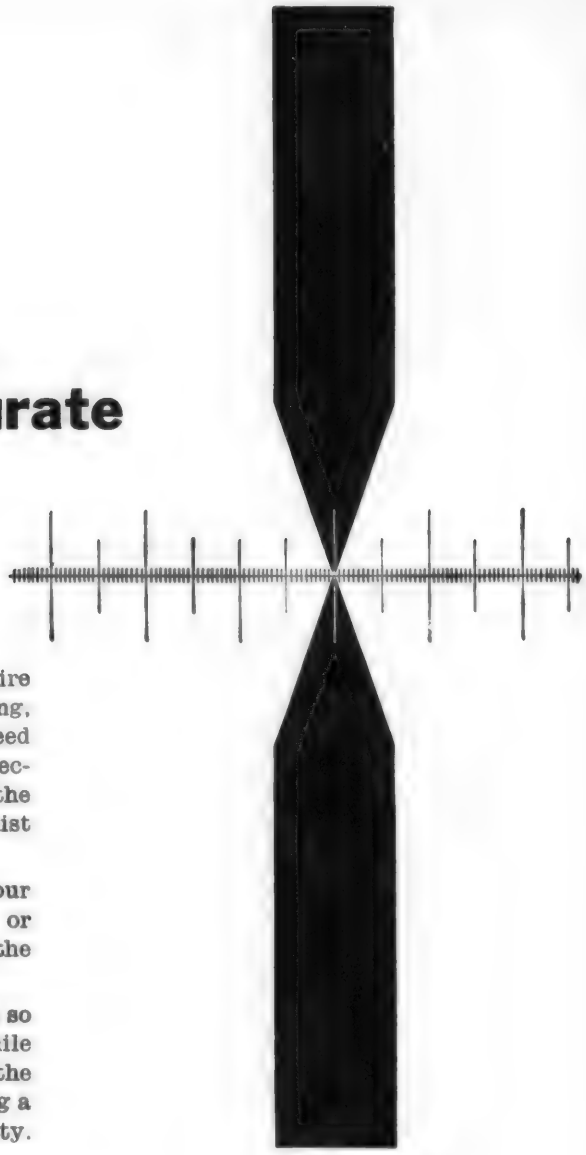

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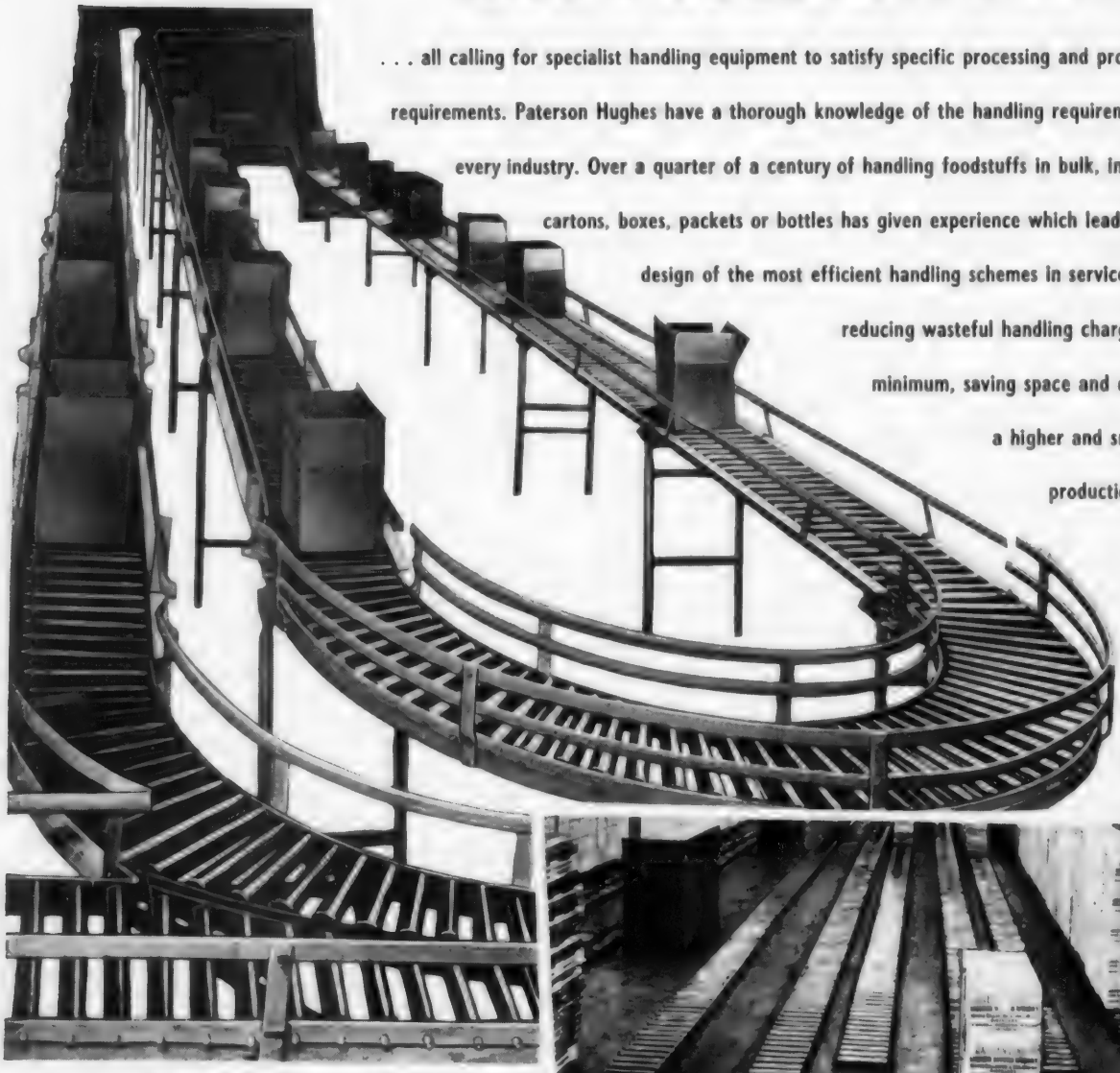

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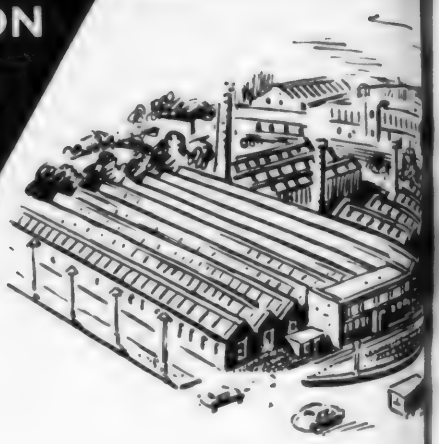

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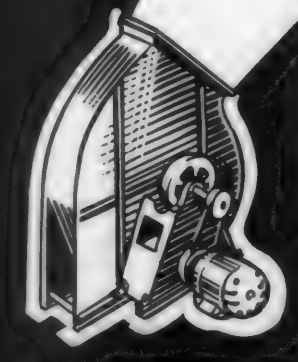

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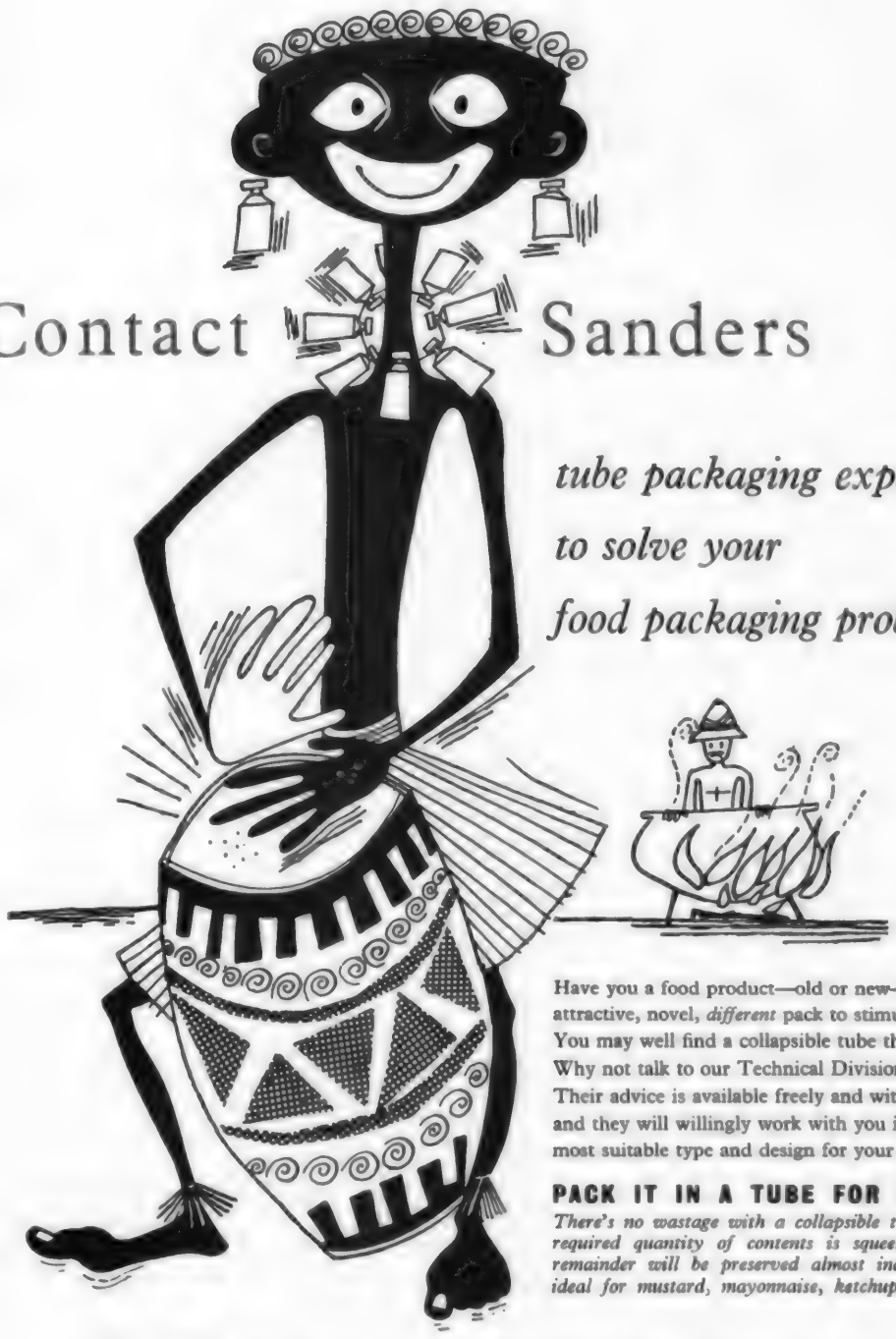

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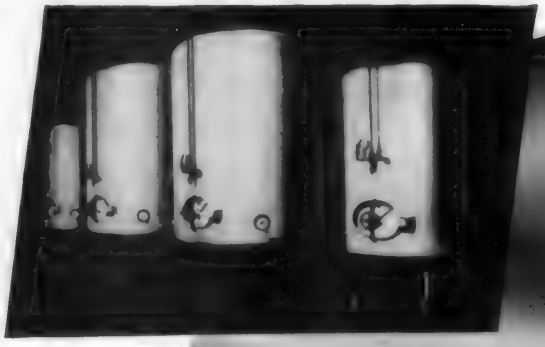

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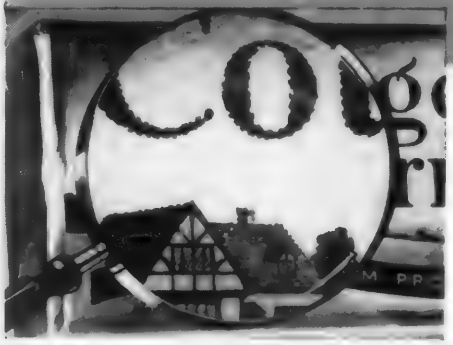

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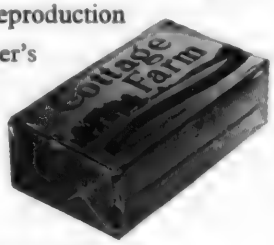

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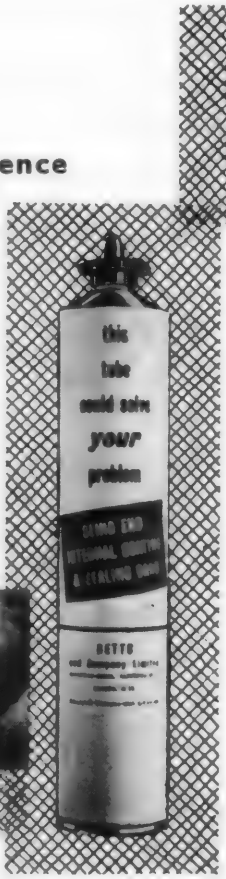

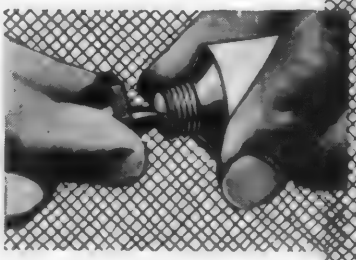

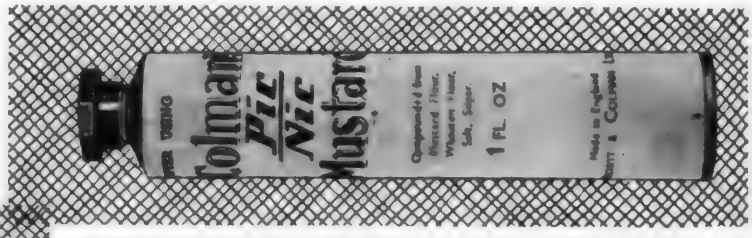

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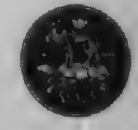

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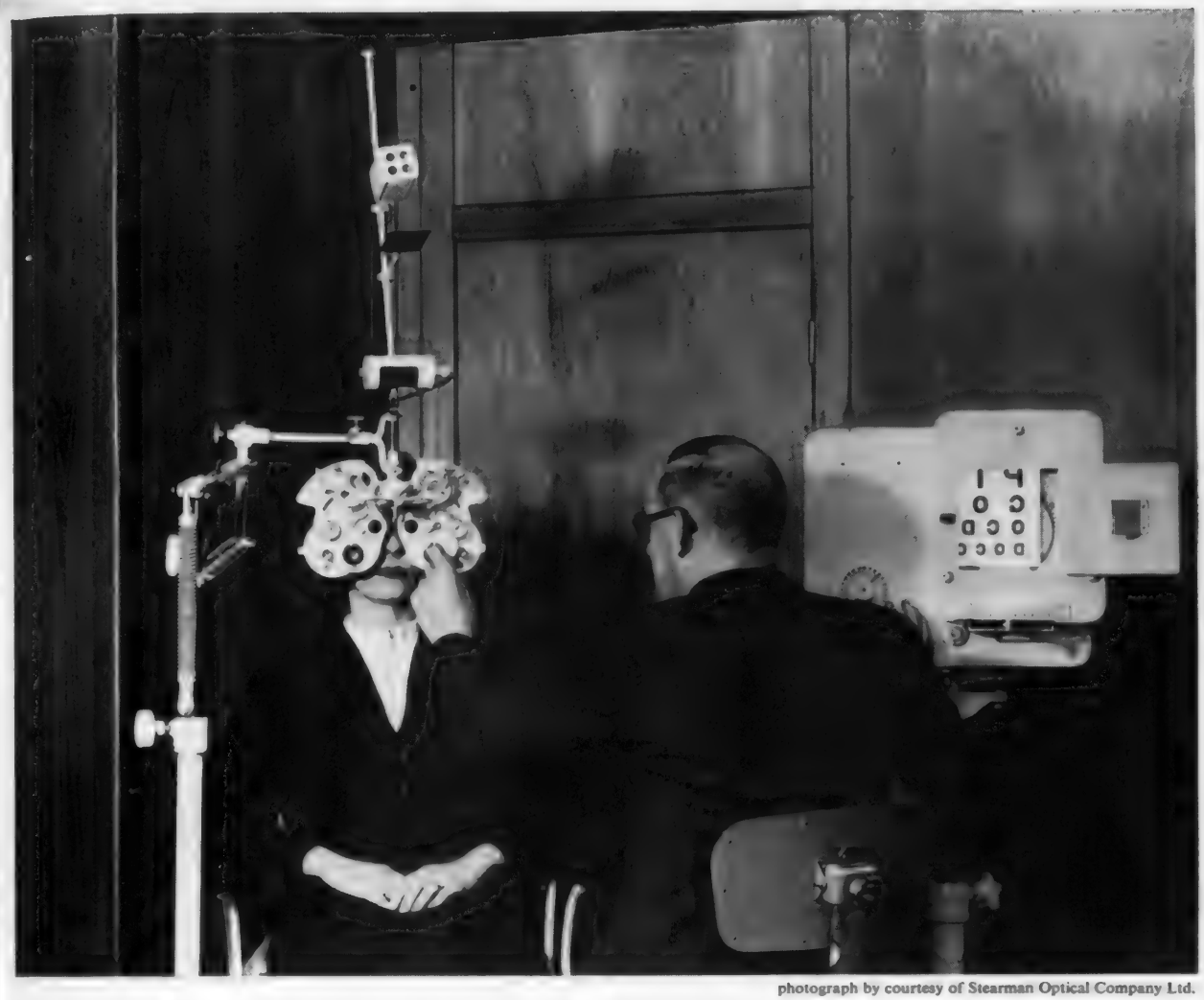

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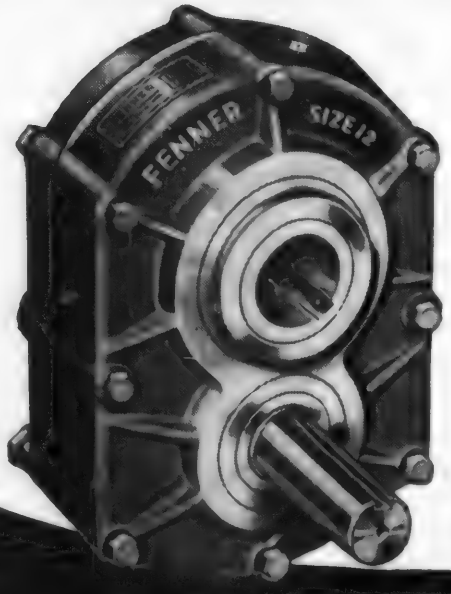

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Our Sales Director is a glutton for publicity. Hence this picture of him dressed up in armour. And the point? He just wants to attract attention, to make people talk to him. But for Pete's sake don't let him get at you! He goes on for *hours* about Stelcon Floors being literally Steel Clad—in steel plate form or with a top surface of steel chippings in concrete to make them exceptionally tough and hard-wearing. So the last thing you want to tell him is that you've got a floor full of holes into which you're always pouring money on repairs. Once you admit that, he's got you sold—sorry, cold!

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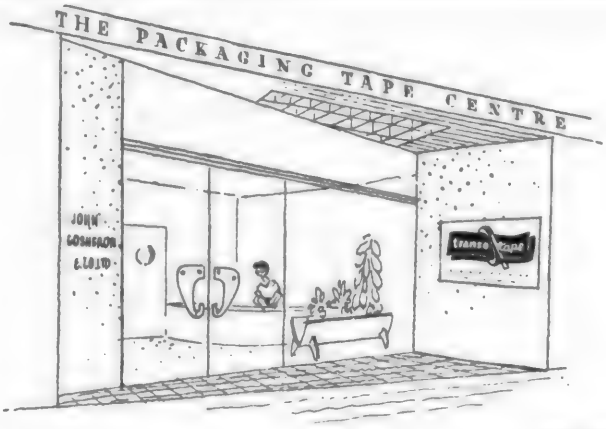

...we've got glass doors!

. . . and not ostensibly to facilitate your view of our charming receptionist . . . oh dear no! (although of course they do, and vice versa) but to enable you to look in on us whenever you pass this way, and be sure of a bright welcome to the Packaging Tape Centre. Our Permanent Display contains a wealth of intriguing uses to which our progressive customers in all branches of industry are putting our products.
Don't fail to look in on us . . .

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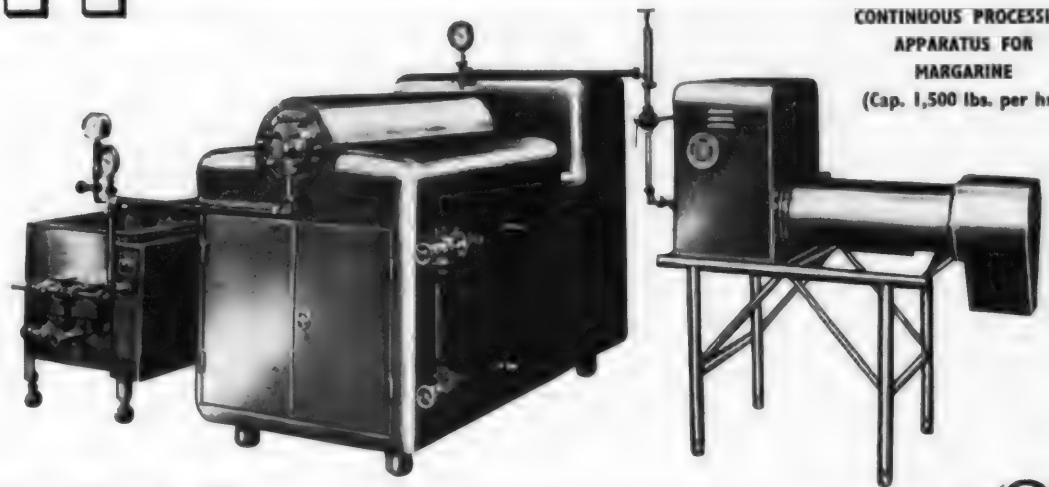
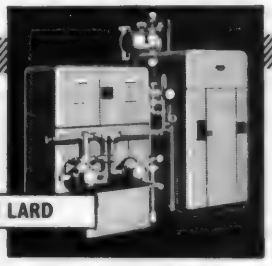
IF you have a food processing problem



CONTINUOUS PROCESSING APPARATUS FOR MARGARINE
(Cap. 1,500 lbs. per hr.)



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MARSHMALLOW

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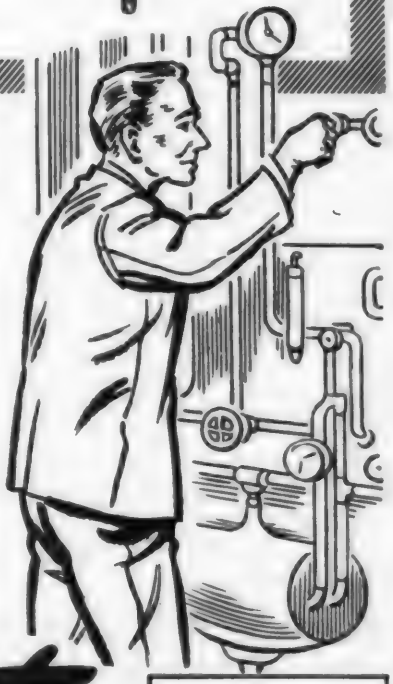

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Whether you are concerned with processing edible fats, or any other viscous heat-sensitive food product, you can enlist the assistance of Johnson's Technical Experts backed by Girdler's 30 years experience and our fully-equipped Votator Pilot Plant Laboratory. All over the world Votator Continuous Processing Apparatus is being used for smooth, automatic production of Margarins, Lard, Marshmallow, Soups, Sauces, Gelatine, Turkish Delight, Starch Jelly, Biscuit Cream, Liquorice and many other well known foods and sweets. The product in its final state is superior in texture and flavour. Write for our illustrated literature.

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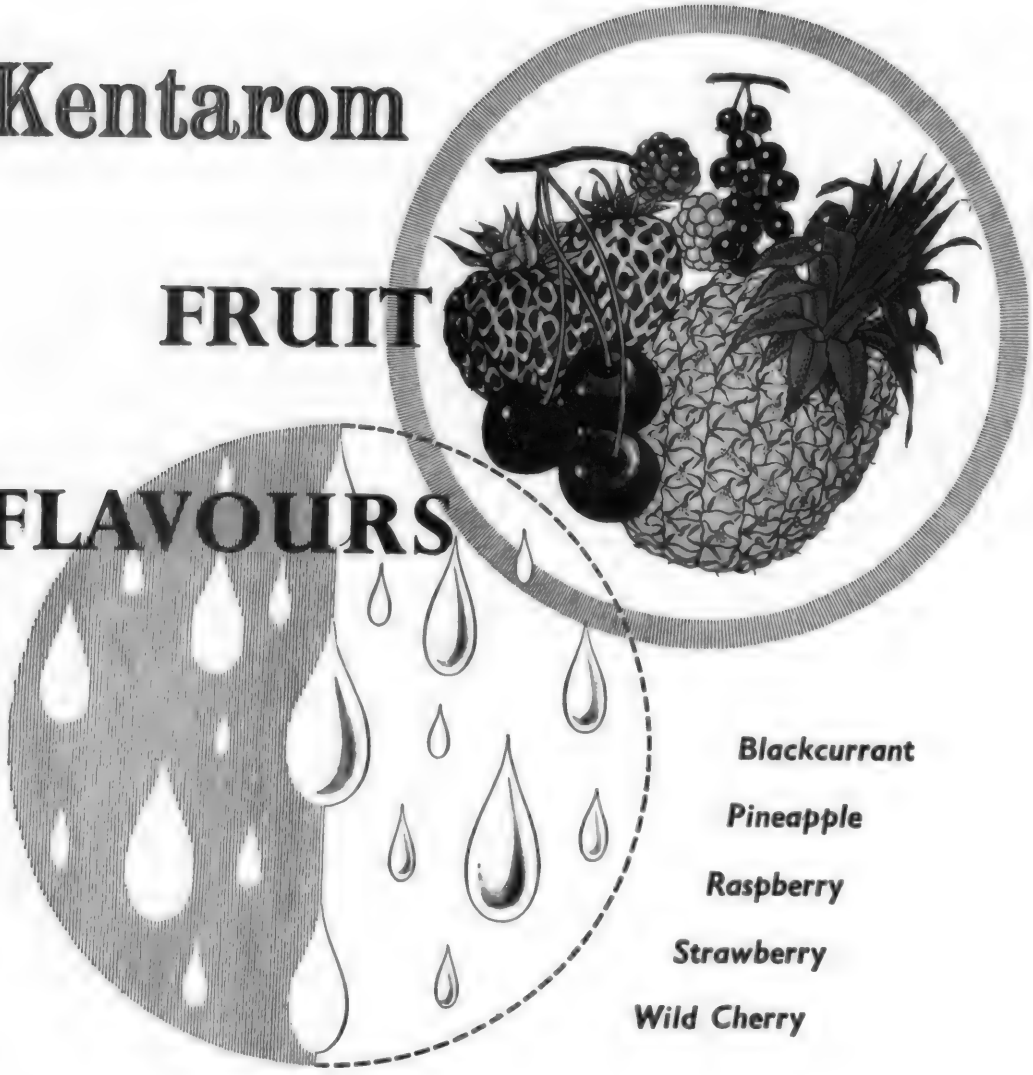

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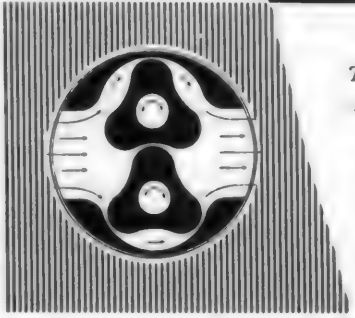

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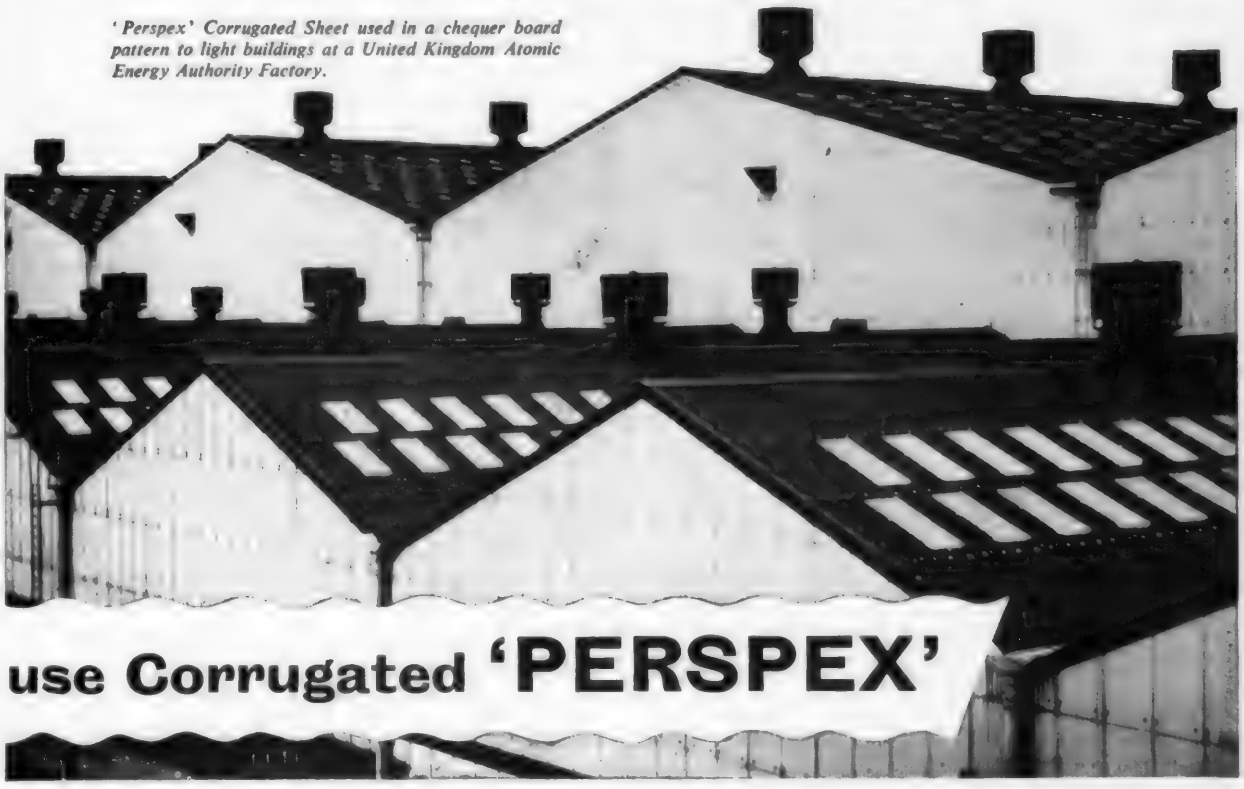

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CORRUGATED 'PERSPEX' acrylic sheet has been proved the best roofing material for factories. It lets in a very high percentage of daylight—the valuable, health-giving daylight that is essential for good morale and efficiency on the job.

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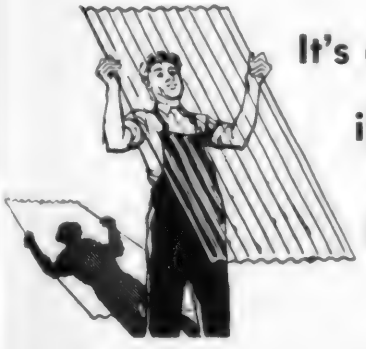

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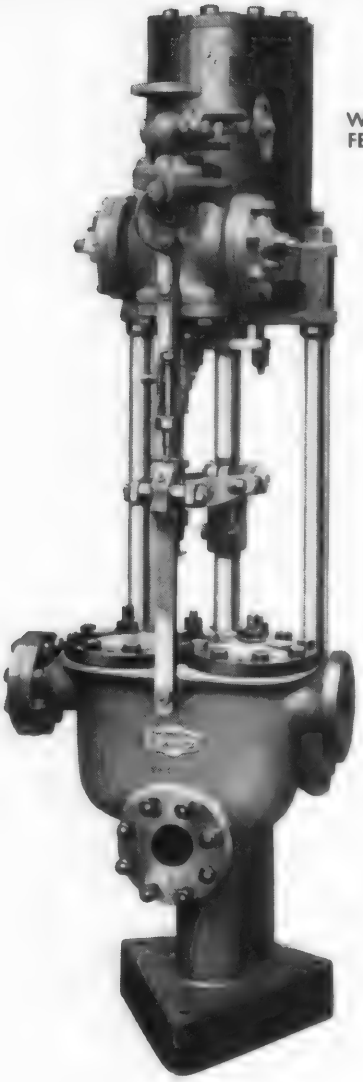

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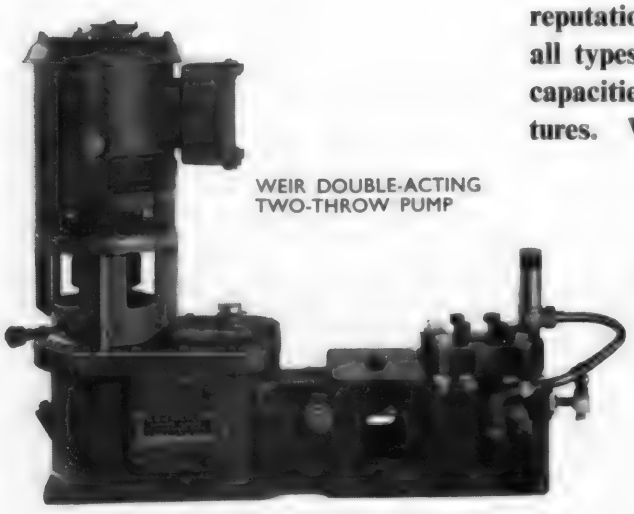

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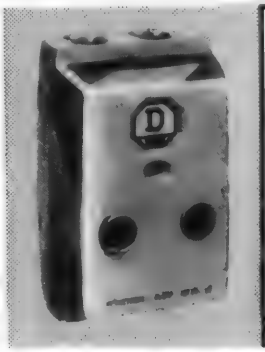
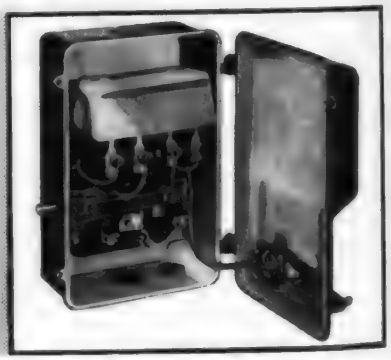
Further details on application.



Type A30 Size 'O' Direct-Switching Starter—up to 3 h.p.



Type A30 Size 1 Direct-Switching Starter—up to 7½ h.p.

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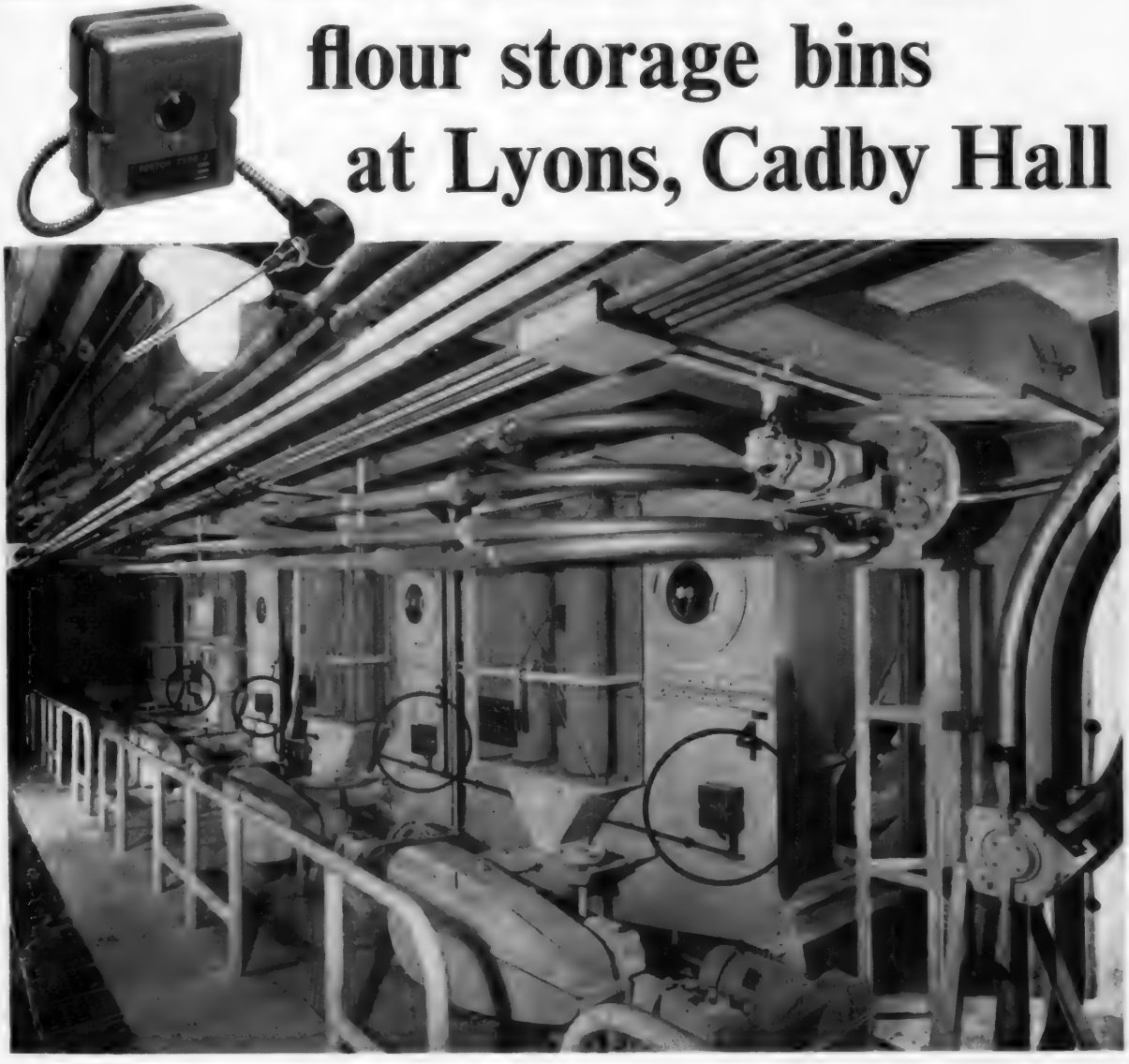
TEKTOR
ELECTRONIC LEVEL CONTROL

watches levels on flour storage bins at Lyons, Cadby Hall



The Fielden TEKTOR is a simple and reliable warning and control device for the level control of liquids or solids. The probe is inserted into the container at the required position and a warning light appears immediately the contents of the container reach that level. Sensitivity is easily adjustable and is so precise that the TEKTOR will work either when the contents touch the probe or merely by their proximity. The relay can be connected to any circuit to operate an external alarm or to control the equipment feeding or discharging the container. Simple to fit, the TEKTOR will work indefinitely without attention.

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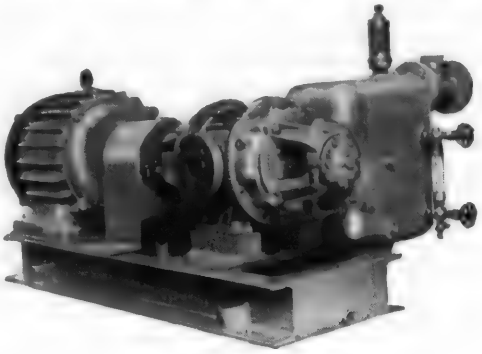

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This vacuum-operated Powder Filling Machine is DUSTLESS in operation!

ALBRO Powder Fillers are so efficient that reduced rates of insurance can be obtained under the Workmen's Compensation Act when powders of a deleterious or abrasive nature are being filled by these machines.

This ALBRO Powder Filling Machine handles bottles, tins, cartons or drums, of many sizes, with equal ease. Even cardboard cartons which are not absolutely air-tight can be filled satisfactorily.

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Machine is hand or pedal operated by junior or unskilled labour.

Output 1,800 containers per hour on smaller sizes.

Two-head, semi-automatic and fully automatic, rotary powder-fillers are also available. Ask for details.

ALBRO Filling Machines

for Liquids, Powders & Pastes

ALBRO FILLERS & ENGINEERING CO. LTD., WHARF ROAD, PONDERS END, MIDDX.

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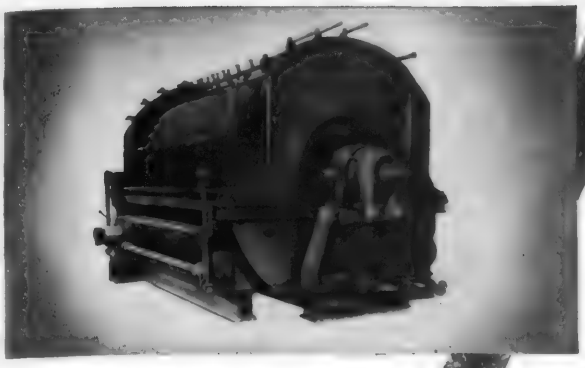
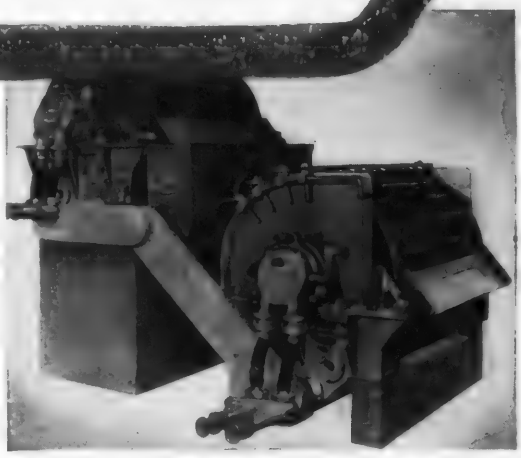
PAXMAN FILTERS

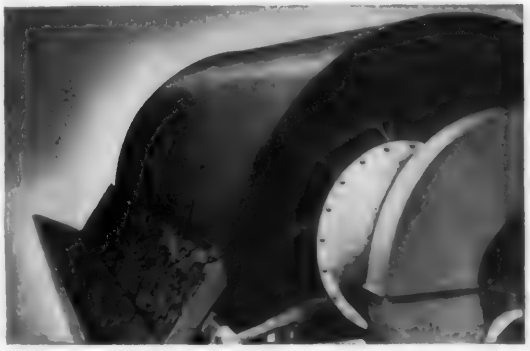
are used all over the world



Leading Dutch paper mills have installed Paxman filters for the washing and thickening of paper pulp. One of the most recent installations, the "Sove" plant at Arnhem—supplied in conjunction with the Cellulose Development Corporation Ltd.—includes five large Paxman filters, some of the deep submergence type, rubber-lined and with stainless steel parts.



Applications of Paxman filters in India include the filtration of paper pulp, the filtration of bichromates in a large industrial centre and the filtration of caustic lime sludge in a large paper mill near Calcutta.



Coal washeries recently supplied by Simon Carves of Stockport for collieries at Zonguldak and Catalagzi, Turkey, include 10 300 sq. ft. Paxman filters embodying cast-iron filter drums of the deep cell type, as used extensively in many British washeries.

WHILE filtration problems in various industries are necessarily individual, the Paxman Rotary Vacuum principle has proved markedly successful in all types of dewatering applications. Our Publication No. 1436 illustrates many specific examples of these which will certainly interest you. A copy awaits your request.

Paxman filters are widely used in the gold fields of South Africa for the filtration of cyanide slimes. Most of them have filtering areas of 700 sq. ft. A recently supplied filter deals with sludge containing calcium sulphate and ferrous hydroxide.

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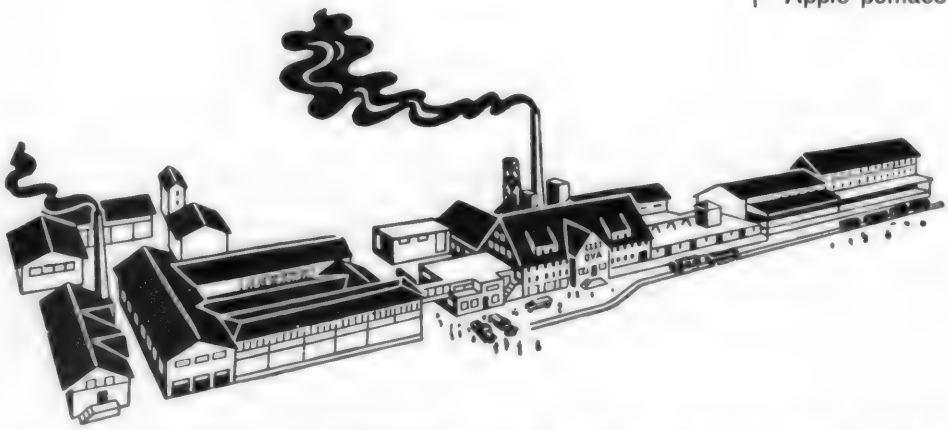

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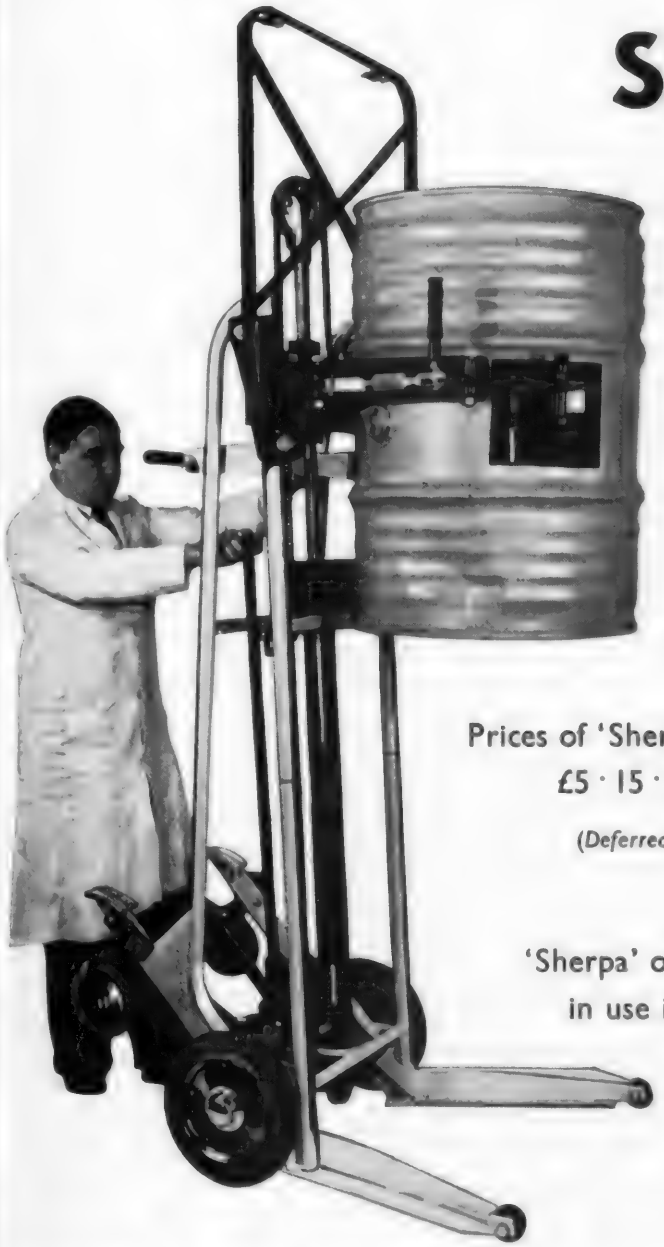

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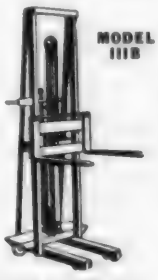

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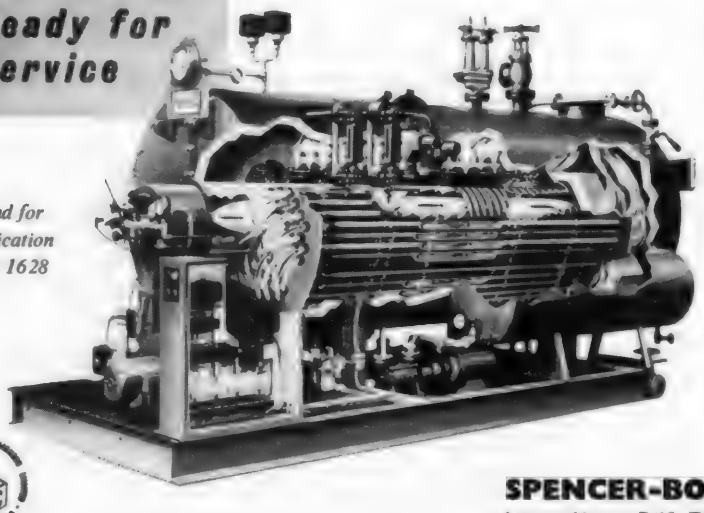

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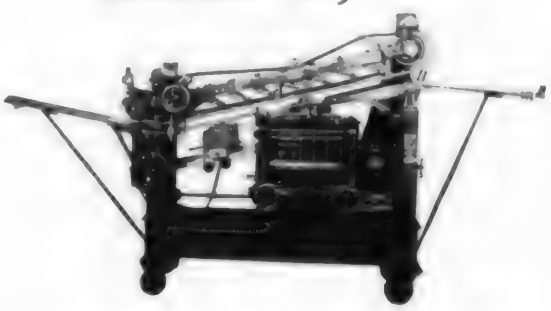

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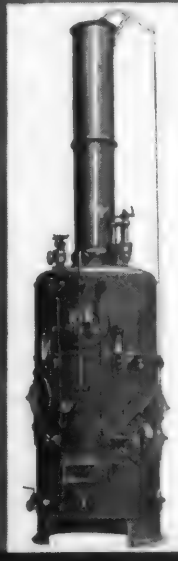

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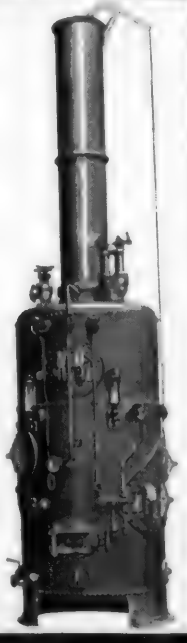

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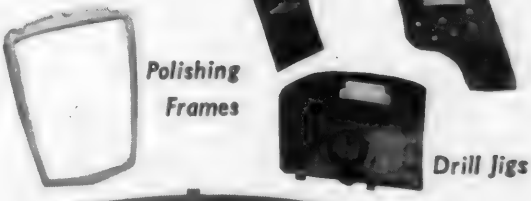

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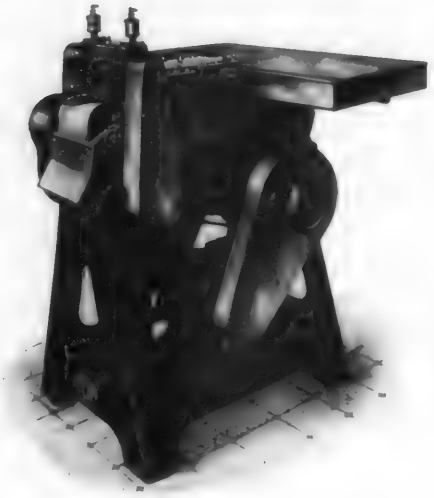

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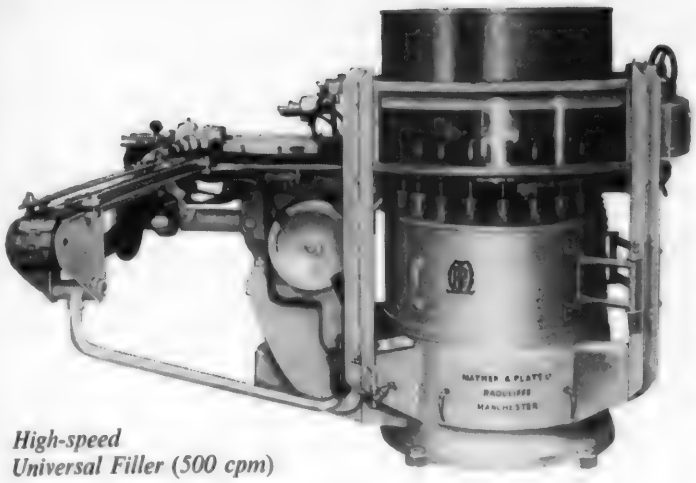

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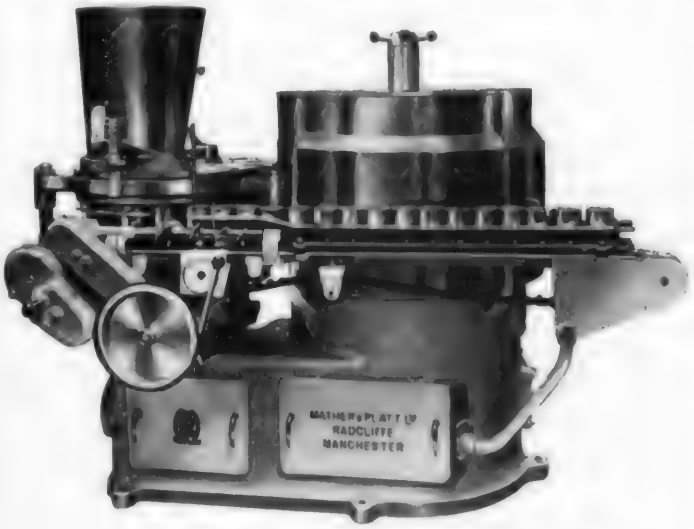

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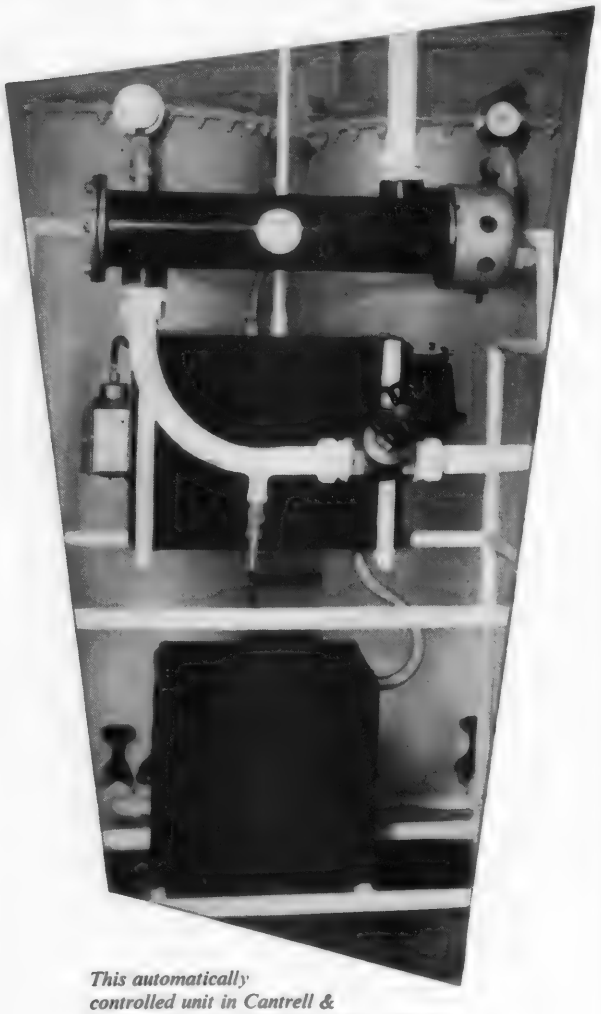

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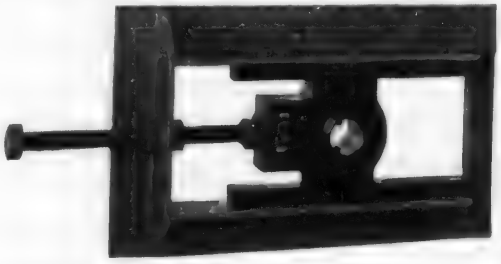

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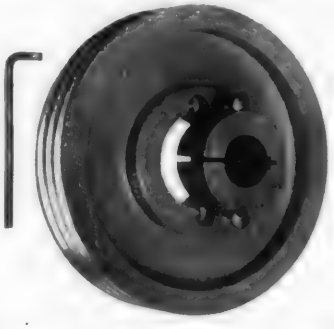

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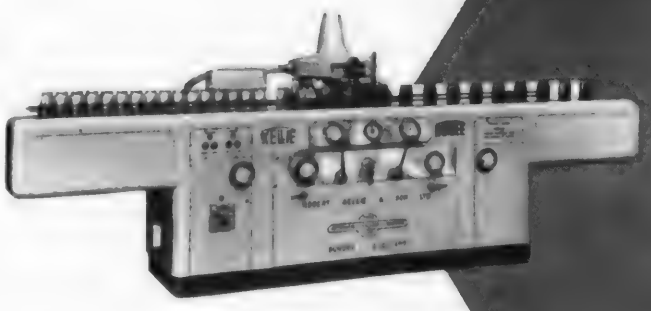

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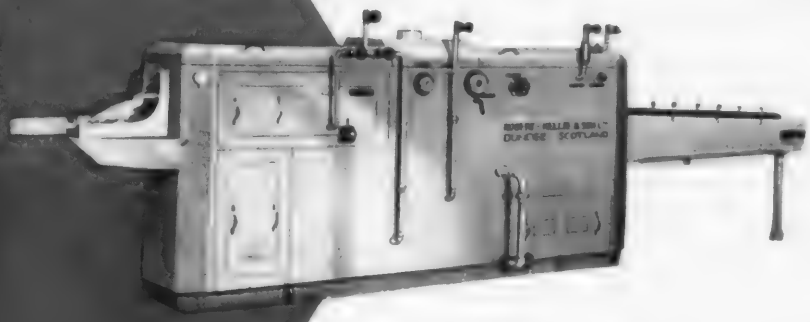

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FOOD MANUFACTURE

Volume XXXII. Number 4 | Published Monthly | April 1, 1957

Editorials - - - - - - - - - 139

SOFT DRINKS:

Science and Schweppervescence - - 143

Annual Review, Soft Drinks and Fruit Juices. *By R. Harold Morgan, M.Sc., F.R.I.C.* - - - - - - - - 146

Plant and Equipment for the Soft Drinks Industry - - - - - - - - 148

Beverage Filtration Equipment and Its Management. *By George B. Beattie* 152

Concentrated Apple Juice. *By R. S. Potter, B.Sc., F.R.I.C.* - - - - - - - 158

Blue Bird Toffees. *By Norman Brampton* - 161

Glyceryl Monostearate in Food. *By S. Cressey* - - - - - - - - - 165

Ethylene Oxide for Cold Sterilisation. *By H. Rauscher, G. Mayr and H. Kaemmerer* 169

Nutrex Re-equip Laboratories and Test Bakery - - - - - - - - 173

Advances in Food Technology - - - - 174

Machinery and Equipment - - - - - 176

News Digest - - - - - - - - 180

Food News Overseas - - - - - - 187

Packaging - - - - - - - - - 188

New Companies - - - - - - - - 190

Trade Marks - - - - - - - - 190

Information and Advice - - - - - 191

Recent Patents - - - - - - - - 192

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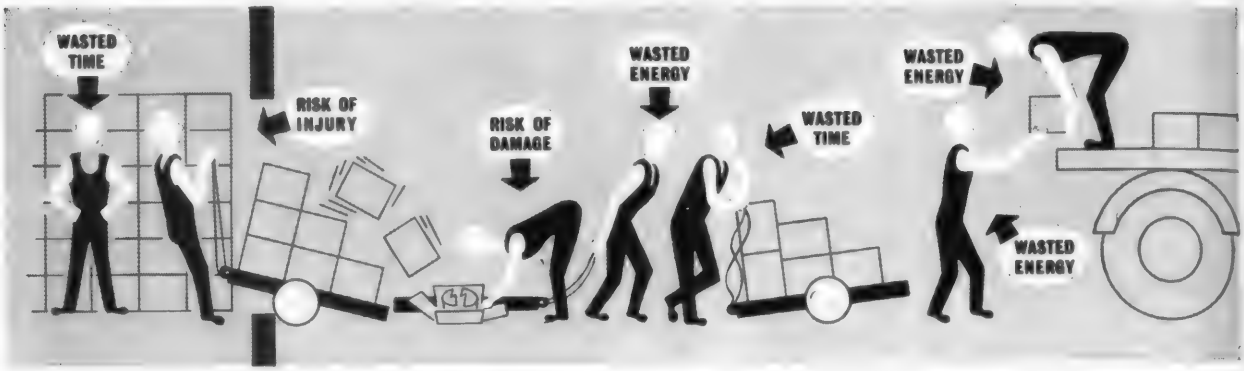

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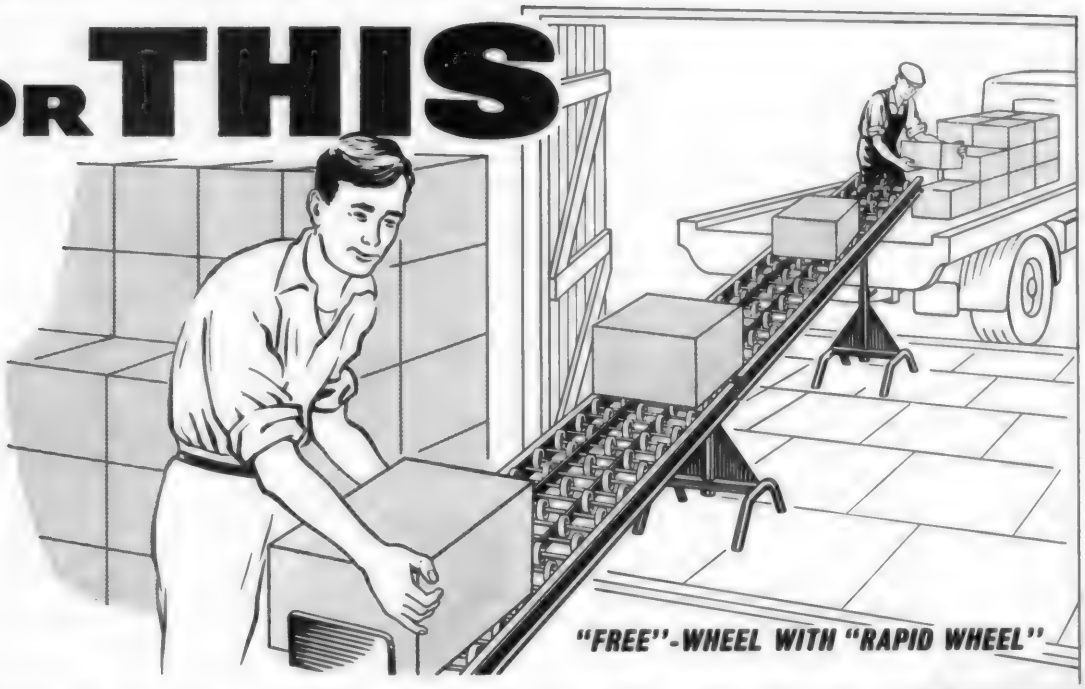

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FOOD MANUFACTURE

Vol. XXXII, No. 4 April 1, 1957

Soft drinks—a growing industry

THE CONSUMPTION of soft drinks is now so high that statistically, each person in Britain drinks nearly a pint every week. The popularity of these beverages has grown so much since the war that output has risen by 100 million gal. since 1948 and is more than twice the pre-war production. Figures supplied by the National Association of Soft Drinks Manufacturers show that the record of 305 million gal. for soft drinks production was reached in 1955, when an abnormally hot summer stimulated sales. However, it is a measure of the popularity achieved by soft drinks that even in the following year, with its very wet summer, output was only 9·2 million gal. less than the record.

Various reasons have been put forward for the phenomenal growth of this industry: the higher standard of living; the Government's welfare orange juice scheme which gives young children a taste for orange drinks; the greater volume of advertising; the development of off-season sales and possibly more drinking at home as a result of television. Whatever the reasons, soft drinks are big business and most breweries now take a great interest in their production, either through a department connected with the brewery or through an associated company producing soft drinks. New products or products whose popularity has increased since the war include the "baby" bottles of fruit juices, the comminuted fruit drinks produced from whole oranges and the carbonated beverages of American origin which are now being produced in this country.

Indeed, compared to the American appetite for carbonated beverages, we still have a long way to go in this country. There, even three years ago, the national production was worth the staggering figure of $1,090 million, and Americans drank 174·2 bottles each. Today one of the main centres of transatlantic social life is the automatic soft drink dispensing machine. Automatic vending machines are also used in this country, but chiefly in factories where workpeople can help themselves. There are two main types, one dispensing the drink in a paper cup and the other supplying the bottled drink at the insertion of a coin.

As far as the manufacturer is concerned, one of the most notable developments in the soft drinks industry is its mechanisation. No reliable statistics are available on the number of soft drinks factories in the U.K. in past years, but it has been estimated that there were some 4,000 factories in existence in 1900. This figure fell to about 1,500 in 1939 and today there are probably not more than 1,200. In other words, while production has more than doubled, the number of production units has actually fallen—a striking testimony to the value of automatic plant.

In this issue of FOOD MANUFACTURE we have made a special feature of mechanisation in the soft drinks industry. Equipment is reviewed on p. 148, while the management of filtration plant is discussed by George B. Beattie. The installation and equipment of Schweppes' new research laboratory is described and, finally, general progress in the industry during 1956 is reviewed by R. Harold Morgan.

Beer—a fiscal anomaly

WHILE the production of soft drinks booms, beer output shows little change. Indeed, while beer stands fast, not only soft drinks but wine sales are increasing.

This has puzzled many people in the beverage industry because theoretically taxation is assumed to be, strength for strength, heavier on wine than on beer. It is a natural assumption—wine is the imported article and is stronger than beer and taxation on any two liquors relative to alcohol content as a rule is higher on the more potent drink.

However, Mr. E. D. Simonds, joint managing director of H. and G. Simonds, has pointed out in the *Financial Times* that this assumption is wrong. For in proportion to alcoholic strength, beer is taxed more heavily than light wines—not only Empire wine but also European table wine. Beer at standard gravity pays almost twice as much duty in proportion to strength as does a foreign light wine at 23 to 24 deg. proof spirit. The tax on beer is about five times as high as it was in 1939, while the duty on foreign light wine is little more than three times as high.

Apparently not very much can be done about this curious anomaly. To take 3d. off a pint of beer would cost the Treasury £90 million a year, while to raise the duty on wine would be a very unpopular measure and would almost certainly result in a loss of revenue. However, Mr. Simonds suggests, the situation should be recognised as a bargaining counter in any dealings over the establishment of a European common market. Even if liquor is excepted from the scheme, British brewers will be continuing with a tax differential to the benefit of the Continental producer.

Docile steers give better beef

INFLUENCES on meat quality "from the breeding herd to the dinner table" have been studied by workers from the Low Temperature Research Station and the Australian C.S.I.R.O., and a report on the progress of this work has now been issued. (*Studies on Beef Quality*, H.M.S.O. 6s. net.)

The report deals with the effect of blast-freezing hot beef quarters, the physiological and biochemical effects of various pre-slaughter treatments and the influence of pre-slaughter treatments on weight losses and eating quality of beef carcases.

The principal findings resulting from the work cover many of the factors which bear on the problems of producing good quality beef. Blast freezing, for instance, can reduce considerably the freezing time for hot beef quarters but tends to make the meat tougher and darker in colour when cooked. Later work has shown that by increasing the speed of the air fourfold and by decreasing the temperature still further, a blast tunnel can be made to produce frozen beef without these undesirable characteristics. A special report of this will appear shortly. Good quality beef has been found to suffer less from evaporation in freezing and storage, and from drip on thawing, than does poor quality beef.

Beef steers have been found to be more resistant to the stresses of pre-slaughter exertion or fasting than other domestic species such as the pig. There are also indications that steers of excitable temperament, even when well fed and rested, may produce meat of lower quality than that obtained from docile animals, even when the latter are moderately hungry or fatigued.

The importance of the changes that take place in the post-slaughter period is emphasised. Except when blast freezing is carried out sufficiently rapidly, greater differences in palatability are found between meat which is blast-frozen without a period of chilling and meat chilled and frozen normally than is found between the latter and meat which is chilled but not frozen.

A passion for peaches and pineapple

WORLD exports of canned and fresh fruits in 1955 were easily the largest ever recorded, reports the Commonwealth Economic Committee. Canned fruit production reached a new record with a world total of 2½ million tons, due very largely to much higher production in the U.S.A., where the output rose by over 10% from 1,620,000 in 1954 to 1,810,000 tons.

There were small increases in other countries, *e.g.* in Japan, where the pack rose from 70,000 to 88,000 tons mainly in mandarin oranges, but generally there was little change. The total for the Commonwealth countries remained almost the same at 406,000 tons, and Australian production fell slightly, though her exports were greater than in 1954.

Peaches are the most popular canned fruit, and production has doubled since the 1934-38 average. Pineapples are also popular, and although the output of canned pineapple fell during the war, it is now 40% greater than the pre-war figure. About 550,000 tons of peaches and 410,000 tons of pineapple were canned in 1955, or 22% and 17% respectively of the total world pack.

Until the wartime restrictions were removed at the beginning of 1953, the British pack consisted mainly of home-grown plums, apples and rhubarb, but in the last few years, in addition to increased supplies of strawberries and gooseberries, there has been a substantial output of canned pears, peaches, apricots and fruit salad produced from imported fresh fruit. In 1955 (when fruit salad was specified separately in the official returns for the first time) these last four items alone accounted for over 35,000 tons, or nearly 40% of the record pack of 90,600 tons.

According to *Fruit—1956* (H.M.S.O. 5s. net.), the world output of fresh oranges and other citrus fruit is now 60% greater than before the war, due mainly to heavier crops in the U.S.A., though production has risen considerably in the Mediterranean and in Commonwealth countries. For deciduous fruits generally the increase in world production has only been about 30%.

The world production of fruit juices reached 600 million gal., again mainly because of increased American production, but there has been a substantial increase in production in several countries in recent years. In Britain the output of blackcurrant juice has increased and is now about 1 million gal. or more a year. On the other hand, the production of pure unfermented apple juice has fallen considerably from nearly 500,000 gal. in 1948 to less than 50,000 gal.

World exports of raisins and currants were much smaller than in 1954 because of lighter shipments from Turkey and Greece. Australia and the U.S.A. also exported less.

Radioactive contamination of fish

MR. W. LEONARD HILL, the founder of FOOD MANUFACTURE, who is shortly returning to England from a world tour which has taken him round the globe, recently wrote to us from Honolulu, where he met some of the leading scientists of the University of Hawaii. Among these was Dr. Howard Boroughs, of the Hawaii Marine Laboratory, who has been carrying out experiments on the effect of radioactive fallout on fish life. He is particularly concerned—as surely we all are—with the possible transfer of radioactivity to people eating contaminated fish.

The Pacific might be described as the hotbed of atomic bomb controversy and Hawaii is certainly an appropriate spot to investigate the potentially terrible hazard of radioactive contamination of marine life. It arises not only from the explosion of nuclear weapons but also from the use of the oceans as dumps for radioactive fission products from atomic power stations. After the British thermonuclear tests at Christmas Island—currently the subject of vigorous protests by the Japanese—there might be an end of bomb explosions if only politicians can be forced to face cold scientific facts. But the problem of dumping radioactive sewage remains. At present only Canada, Russia, Britain and the U.S. are disposing of these wastes, but even within the next ten years the volume will grow enormously as more and more nuclear power stations and research centres come into being and nuclear energy is used to power ships.

There is much speculation on the suitability of deep water areas for the reception of radioactive wastes, on the rapidity of the spread of radioactivity, and on the mobility of sea creatures.

After the atomic explosion at Bikini, the sea temporarily became more radioactive as far as 2,000 km. in one direction and 1,000 km. in the other. After a time the waters were so mixed that this increased activity could no longer be detected Dr. Finn, director of the Fisheries Division of the FAO, has pointed out that the sea's natural radioactivity is only about one-tenth of the natural radioactivity on land and that fish and other living organisms in the seas concentrate radioactive elements in their bodies—the concentration in living tissue ranging from 1,000 to 100,000 times more than in an equal amount of surrounding sea water. If the radioactivity of the water was heavily increased it could kill the marine life or it could cause a dangerous concentration in fish eaten by man.

The problems become fantastically complex. Fish feeding on marine plants which also accumulate radioactivity rapidly, would take up the elements themselves. Fish swimming through radioactive areas may become contaminated and then perhaps be eaten by bigger fish many hundreds of miles away which would then in turn become radioactive. Roaming fish such as tuna and swordfish could easily carry radioactivity over thousands of miles of ocean. Other fish, such as eels or salmon could carry radioactivity from the sea to inland waters or *vice versa*.

Radioactive contamination is a real and urgent problem, one of the most pressing confronting science today. Some radioactive elements have very long lives—strontium-90, for instance, has a half-life of 28 years and caesium-137 a half-life of 33 years. Thus, in planning safe methods of disposal, engineers and scientists must consider whether the precautions they take today are capable of safeguarding the food supplies of unborn generations.

Packaging odours

A FIRM printing wrapping papers received a complaint from their customer that some of these wrappers smelled unpleasant and could not be used. No complaints were made of another batch of wrappers which, it so happened, were printed with the same ink. When the samples were examined further it was found that the odour was entirely due to the parchment paper used in the process.

Other complaints investigated by the British Carton Association concerned cartons for foodstuffs, chocolate coated sweets and biscuits and soft boiling sweets which gave off objectionable smells, and they have led the Association to publish notes for guidance* on the causes of this contamination, methods for its determination and means to avoid it.

Paperboard is almost completely sterile when it comes off the board-making machine, but subsequent operations might produce a certain amount of reinfection, principally by mould spores, which will develop an odour if the infecting organisms are allowed to grow. This can be prevented by attention to storage conditions, where the relative humidity should not be allowed to rise above 60%. Relative humidity will also be affected if the board is transferred from a cold warehouse to a warm factory. The board should be kept in its wrappers until it has been stored in the factory for about two days. The same general rules apply to the finished cartons.

The problem of moisture control of paperboard packages continues throughout the product's life. If, for example, a transparent film overwrap is placed round the box, the fact that this wrapper is a good odour barrier makes it possible for the concentration of odour within the barrier to rise considerably and may well contaminate the whole package.

The principal points to watch when specifying any

* *Odour from Paperboard*. British Carton Association. 9d.

pack containing paperboard are (*a*) is there any need for an overwrap? (*b*) is a moisture vapour barrier in contact with the food product? (*c*) what will be the moisture content of any paperboard within the moisture barrier? (this generally depends upon the moisture content of the packed food product), and (*d*) how sensitive to odour is the material to be packed? For example, one type of paperboard may be quite satisfactory when used with a biscuit with a high fat content, but the same material may develop off flavours in a product with a high moisture content.

A practical move to improve the packaging of sensitive foodstuffs has been made in Scandinavia. Following the publication of the B.C.A.'s report, the associated folding boxboard mills of Finland, Norway and Sweden have announced that virgin fibre board which satisfies the recommended standards of purity and ease of handling will in future be designated by a special mark SCAN. They have set up an Information and Research Department to help improve the quality of the boxboard.

"Goldie" makes good

THE STORY of golden syrup—once a "tiresome by-product" which is now being manufactured at a rate of over a million cans per week—was told recently by Tate and Lyle in their annual report and accounts.

"Goldie," as the company calls this product, was the foundation of the prosperity of Abram Lyle and Sons. In 1863 it was just a form of treacle and was produced at a rate of about 1 ton per week. Its reputation grew with its steadily increasing quality, and production kept pace with both. In 1884 10 tons of golden syrup were being made each week, and five years later this had risen to 100 tons weekly. The present composition, colour and flavour were reached in the early 1900s and have remained practically unchanged. Today "Goldie" is such an important speciality product and so much care is devoted to its manufacture that its cost of production, apart from its sugar content, is three times that of granulated sugar, while its packing costs are seven times as much. In spite of this, the retail price is only around 11d. per lb. and the product sells in competition with jam, the retail price of which varies from 1s. 5d. to 2s. 3d. per lb.

Tate and Lyle admit that they claim no "fancy health-giving properties" for "Goldie," but say that it is in fact valuable dietetically. It contains 32·5% sucrose, 47·9% invert sugar, 3·2% non-sugars and 16·4% water.

Although there is no evidence that glucose is superior to sucrose, its presence in golden syrup pleases many people who have been taught to admire its properties because "a little of what you fancy does you good."

Ghana and cocoa

WE would like to add our welcome to the transformation of the Gold Coast into the new independent state of Ghana which took place on March 6. We also welcome the announcement that neither Ghana nor Nigeria intends altering their present cocoa marketing system. Until this announcement was made there were persistent rumours that one of Ghana's first independent actions would be to establish a cocoa market in Accra. This would have meant the end of the marketing organisation in London.

Instead Prime Minister Nkrumah has proposed holding talks with other members of the sterling area to work out an "insurance scheme" to cover Ghana's cocoa in times of depression.

In 1955, cocoa exports valued at £65 million, formed 28% of the Gold Coast's gross national income and over two-thirds of total exports, while export duties on cocoa contributed to more than half of the ordinary Government revenue. The country is heavily dependent on cocoa, and the fall in the world price from £392 per ton in 1954 to the present average of £200 has not helped her economic position. However, the temptation to establish a market in Accra with the possibility of higher prices has been wisely resisted. There have been sharp reactions to high cocoa prices in the past, and the break-up of the present selling organisation, which has worked well, might weaken the bargaining position of West African producers.

Boiled mud

A PREHISTORIC pig and poultry food may be provided from mud brought up from the bottom of Lake Victoria in East Africa, according to the director of the East African Fisheries Research Organisation, Mr. R. S. A. Beauchamp.

When they investigated the lack of sulphur in the lake and its consequent scarcity of lake plankton, workers at the Research Organisation found that the mud—instead of decomposing at the normal rate and giving back to the water the elements derived from dead plankton, weeds and water animals—had retained most of the accumulated nutrients gained during thousands of years. Yet the water is infertile for lack of nutrients. Samples of the mud were found to be very rich in sulphates, nitrogen and other plant nutrients. It decomposed when boiled or dried. The dried mud is a very fertile market garden soil. Mr. Beauchamp also believes that, dried and powdered, it could be a valuable pig and poultry food because of its mineral and protein content.

He claims that the mud is not unpleasant to eat and has tried it on himself, his family and friends to prove this point.

Science and Schweppervescence

Making the most of a small site in North London, Schweppes now have central laboratories for research on flavours, water, microbiology, packaging and other aspects of soft drinks technology.

A NEW research laboratory, opened recently at Hendon, North London, enables Schweppes for the first time to centralise under one roof all the various types of research it conducts for its world-wide organisation. Apart from its 12 British branches, the company's products are made in 21 foreign countries. Research work at Hendon aims not only at high standards of quality, but at absolute standards of uniformity. A soft drink produced by Schweppes in, say, Hong Kong, must be identical in all respects with the same variety produced in Britain.

The technology of soft drinks and fruit products has grown considerably in recent years and now includes flavour research, the chemistry and treatment of water, microbiology and packaging studies. Schweppes, Ltd. have recognised the importance of quality control and research for many years. In the past five years quality control has been carried out at each factory equipped with laboratory facilities. Research and development functions are carried out in the central laboratories, which now occupy the new building at Hendon. Until now, the central laboratories have been split into various sections occupying small laboratories at the Hendon and Vauxhall factory sites. In 1953 the decision was taken to build the new research laboratory on the Hendon factory site which is about 7 miles from the firm's head office at Marble Arch in Central London.

(*Above left*) The new tasting panel room. The lighting can be varied to disguise the colour of samples. (*Right*) Interior of stainless steel inoculation room attached to the microbiological laboratory.

Planning

The basic principle behind the planning was that a well-equipped research laboratory in the soft drinks industry should have all the facilities provided in a modern

food technology laboratory, including those for the development of new products and processes up to, and including, the pilot-plant stage.

The site of the new laboratory, accessible from the factory and from a residential road, is 7,500 sq. ft. in extent—a restriction of building space which has led to the development of a multi-storey building.

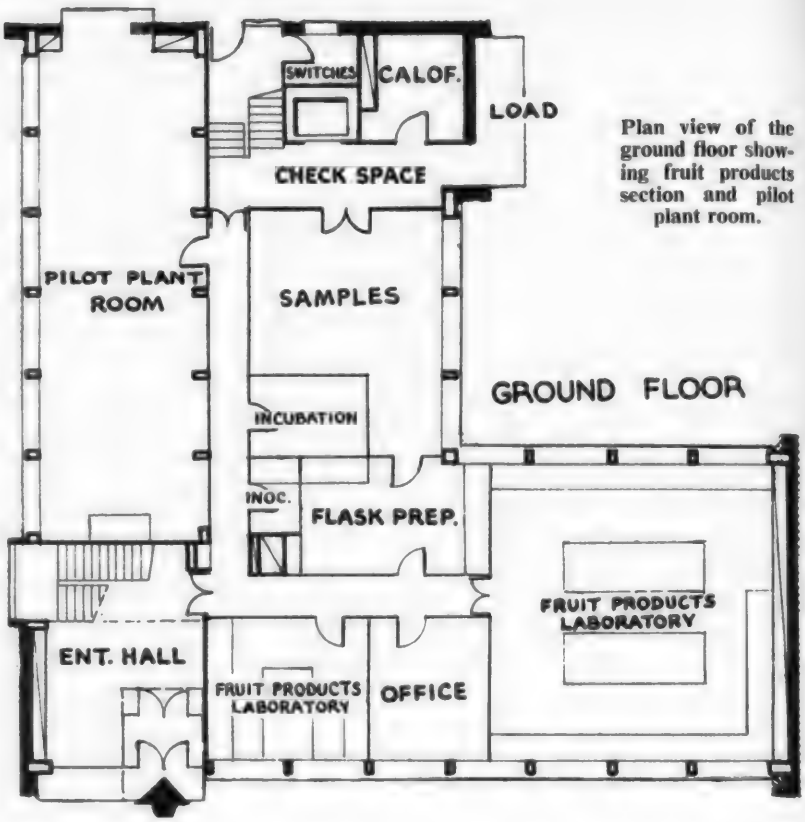
It was required that the building should be planned to give the utmost flexibility for any necessary future rearrangement of internal planning either in part or as a whole. To achieve this, services to each floor are independent and concealed in the space beneath the floor; partitions are removable and light fittings and air diffusers are recessed into ceilings. Adjustments to any of the laboratory layouts can be made without disrupting work in the remainder of the building.

The work of the laboratories is organised into four sections: Product development, Analytical methods, Microbiology and Fruit products.

Each section's requirements for bench space and storage space were taken into consideration and then provision was made for the special rooms, such as the library, taste panel rooms, hot and cold rooms, dark rooms and pilot-plant rooms.

Bearing in mind the need for flexibility, a system of unit furniture was adopted so that bench layouts may readily be changed. The benches were designed and made for the research department's requirements.

A decision was taken not to provide special rooms for washing glassware, and each laboratory has a large sink for this purpose: it was also decided not to provide a balance room, despite the fact that both these decisions were contrary to modern design. Another concept which was kept very much in mind in planning the laboratory was that there should be ample storage capacity for samples, etc., in the new building.



Plan view of the ground floor showing fruit products section and pilot plant room.

Analytical methods section

This is housed on the top floor. The main laboratory has two U-shaped benches. This rather unusual layout is an attempt to organise the analytical tests in a systematic way, thus avoiding the carrying of the samples backwards and forwards from bench to bench. This laboratory is also equipped with a large forced-draught fume cupboard complete with hood fitted with extraction equipment. The drying cupboards and waste-disposal bins are in-

The fruit products laboratory.

Schweppes' new laboratory building as seen from Garrick Road, Hendon.

corporated in the benches of this and all the other laboratories.

An adjacent laboratory has been planned for the development of analytical methods and is fully equipped with modern instruments.

The microbiological section comprises three rooms—a general microbiological laboratory, incubation room and inoculation room—the latter being constructed in stainless steel and equipped with ultra-violet lamps so that the room can be readily sterilised. The lamps are enclosed by plate glass screens to protect the operators, and a cold plate with a thermostat is provided. As far as it is known, it is the only room of its kind in Europe.

The taste panel section comprises a preparation room and a tasting room. The tasting room is laid out so that tasters cannot see the preparation they are about to sample. It has six booths which can be illuminated with various combinations of light to mask colour difference in samples, since colour is known to have an effect on taste.

Hot and cold storage rooms, chemical apparatus store, samples room and office take up the remaining space on this floor.

Product development section

The product development section occupies the first floor. In addition to two general purpose laboratories, there are a number of special rooms on this floor—dark room, essence and chromatographic room, instrument room and library—as well as the research office and conference room. The main laboratory has two side benches occupying the whole length of the laboratory, one double-island bench and a single-island bench. The third wall of the laboratory is fitted with a forced-draught fume cupboard. In laying out the bench arrangements in this room, particular care was taken to allow much free floor space so that new equipment can be set up without hindrance.

The other general purpose laboratory is equipped with an L-shaped bench.

The essence and chromatographic laboratory has a special ventilator. Substances having a very strong odour are used and will, in future, only be used in this room. But for the special extraction ventilator, the odour from these compounds would spread throughout the building and could readily interfere with tasting tests being carried out in other parts of the building.

The dark room houses, at the moment, a projector for the examination of glass bottles, a photomicroscope and photographic equipment.

Fruit products section

The ground floor is occupied by the fruit products section and half of the wing of the floor is also taken up by the pilot-plant room. The main laboratory, which is the same size as the analytical laboratory, has two side benches the whole width of the laboratory and two large island benches. The east wall is fitted with fume cupboards.

The adjacent rooms are fitted out for microbiological work on fruit products, and comprise a flask preparation room, inoculation room and incubation room.

The other laboratory on this floor contains two side benches, fume cupboard, and one island bench. This laboratory is set out for the chemistry, rather than the technology, of fruit products.

Pilot-plant room

The pilot-plant room houses equipment which consists of small-scale replicas of commercial equipment. Various pieces of equipment may be interconnected to simulate a small-scale plant or used individually to study one or more parts of the process. One function of the pilot-plant studies is to gain operating and design data which may be projected to large scale operation. Another is the preparation of a sufficient quantity of new or improved products for testing on a wide scale.

Clearly the pilot-plant laboratory must contain equipment and service facilities of maximum flexibility. The pilot-plant room is fitted with a crane rail and a sliding shutter door giving access to a loading platform at the rear of the building. It has an acid-resisting tiled floor. Service pipes (electricity, steam, hot and cold water and gas) are encased in a rack suspended from the ceiling. Plant up to 23 ft. high may be erected by opening the sliding doors in the ceiling.

SOME SUPPLIERS OF EQUIPMENT

Ultra-violet equipment: *Hanovia, Ltd.*
Refrigeration: *L. Sterne and Co., Ltd.*
Infra-red equipment and photographic equipment: *Hilger-Watts, Ltd.*
Incubator: *Baird and Tatlock, Ltd.*
Balances: *L. Oertling, Ltd.*
Polarograph: *Cambridge Instruments, Ltd.*
Scientific equipment: *A. G. Gallenkamp, Ltd.*

FOOD MANUFACTURE
ANNUAL REVIEW

Soft Drinks and Fruit Juices

By R. Harold Morgan, M.Sc., F.R.I.C.

Output up to 296 million gal. ★ Fruit juice supplies ★ Packaging and presentation ★ Cloud stability ★ Dehydrated citrus juice

IT IS doubtful if the enormous increase in the consumption of soft drinks since the war is fully realised by those who have no direct interest in the industry.

From an intake of approximately two gallons per head of the population in 1939, the annual consumption has steadily increased until it reached some six gallons *per capita* in the record year 1955, which figure, though well below that for beer, does indicate that the industry has graduated to one of national importance.

While weather conditions affect the consumption of these non-alcoholic beverages—the hot summer of 1955 materially contributed to that year's record gallonage of 304,978,000, it is obvious that during post-war years the effect of seasonal influence is less pronounced owing to increased sales in what were formerly the off-seasons.

During 1956 the output, as ready-to-drink beverages, was 296 million gal., which is far greater than the output for the year 1954, and for 1953, which had shown the greatest consumption prior to 1955. The figures confirm the view that soft drinks are becoming established as an item of the daily diet throughout the year, and not solely consumed for their thirst-quenching quality in hot weather.

In attempting to review the annual progress of an industry, it is customary to refer to any outstanding development which may have taken place during the period. No major items of this nature have come to the notice of this reviewer, but there are a number of matters of interest which can be recorded. No particularly new beverages have been observed, but the previously introduced comminuted fruit drinks, particularly orange, have established themselves in public favour. The success of this beverage lies in its flavour appeal due to contact of the whole fruit with the extraction syrup, particularly when freshly prepared.

Fruit juice supplies

Fruit juices are being increasingly used in beverages, and the increased demand tends to cause occasional temporary shortages in supplies. Such difficulties did not occur during mid-1956 owing to the poor summer, and it is reasonable to suppose that there may be some users with stocks in hand of old grape juice, particularly those who were hopeful of a repeat of the hot weather experienced during the previous year.

For the current year it is reported that the Spanish production of oranges has been most seriously affected, and the crop has been so bad that it is estimated that only about 15% to 20% of the normal crop will be forthcoming. On the other hand, Sicilian lemon juice, though three to four weeks later than usual, promises to be of good quality and in good supply.

Plastic closures and liners

Improvements in the form of presentation—bottles, stoppers, labels, etc.—have been particularly noticeable in the products of several manufacturers. The increased use of plastic external screw stoppers and internal screws of the same material has been marked during the year and they are now a serious competitor of the old ebonite type. The variety of colours in which plastics are obtainable adds to the sales appeal of the container.

While on the subject of stoppers, experiments have been carried out on the use of plastics in place of ordinary corks with varying degrees of success. Polyethylene stoppers of various forms are in use abroad for closing wine bottles and, while corks as such do not play an important part in the soft drinks industry, the cork liner in crowns is of vital importance in sealing corbonated beverages. American sources predict that the plastic liner will some day entirely replace cork, and experimental batches have been tried out during the year.

It is claimed that plastic liners have many advantages such as consistency, uniformity, high carbonation retention, freedom from moulds, rigidity due to the bonding of plastic on metal, and greater product resistance.

Pre-mixes

An exhibition provides an opportunity of assessing recent developments in the various types of equipment used in the industry. This will take place dur-

ing the current year, but during the year under review, as in every year, machinery manufacturers have made slight improvements to increase the efficiency of individual units. The control of carbonation is a subject on which much research is being carried out, and experimental plants incorporating new ideas have been on test under actual factory conditions for long periods during the year. The question of premix has received some publicity recently and the principle, which is not new to this country, appears more applicable to the lower carbonated American beverages. The view is held that with low to medium carbonation and a standard flavour in a standard bottle it can compete successfully with a more orthodox syruping and filling machine, but for the manufacturer who has a range of flavours including fruit drinks, the more orthodox type of plant has the advantage.

International Fruit Juice Congress

An important international conference on fruit juices was held in Germany at the end of May, and scientists from many countries took part.[1] A variety of topics were discussed and it is only possible to refer to a few items contained in the voluminous report. The need for standardising concentrated juice was stressed, particularly as vacuum concentration is being increasingly employed in many producing countries. This necessitates regular testing of the straight juice and the chemical and physical test to which raw juices are subjected include soluble solids content by refractometer, acidity by titration, determination of steam-distillable peel oil, cloud, free and suspended pulp, colour, ascorbic acid together with microbiological examination.

While pasteurisation inhibits fermentation of citrus juices, it is important to prevent subsequent yeast infections arising from improperly cleaned equipment. Large scale unpasteurised production in U.S.A. has introduced different types of spoilage resulting in souring or off flavours of a buttery type. This has been shown to be due to bacterial development. Ascorbic acid was recommended as a stabiliser of fruit juices to prevent browning due to oxidase and peroxidase. The high solubility of the acid simplifies fortification, and to prevent loss the addition should be made during the bottling operation. Containers must contain the minimum amount of air or oxygen as 1 ml. can destroy 1 mg. of ascorbic acid.

Cloud stability of frozen orange concentrates

Some papers of interest to the soft drinks industry have been published in scientific journals during the year. Results have been reported of research on cloud stability of frozen orange concentrates carried out at the U.S. Citrus Product Station.[2] For several years the use of some type of heat treatment for stabilising purposes has been widespread in the manufacture of frozen orange concentrate. The object of the stabilising process is to prevent loss of quality, exhibited by gelation or separation.

This loss of quality has been generally attributed to the activity of the enzyme pectinesterase and heat treatment partially inactivates these enzymes. Experiments were carried out to determine the effect of different heat treatments on enzyme inactivation and cloud stability on 42° Brix concentrate. Extracted juices were passed through a finisher equipped with a 0·033 in. screen, then heat treated and concentrated to 55° Bx. in a falling film evaporator. The concentrate was cut back to 45° Bx. with unheated single strength juice.

Various heatings were tried ranging from 140°F. to 210°F. with holding times varying from 1 to 120 sec. It was noted that the stability was not apparently increased at 140°F. for 5 sec., but temperatures of 150°F., 160°F. and 170°F. progressively increased stability from 16 to 23 days. Samples heated to 190°F. or 210°F. and held for 5 sec. remained stable for the entire test period, *viz.* of not less than 42 days. Increasing the holding time by 15 sec. at the temperature range of 160°F. to 180°F. tended to reduce stability.

Pectinesterase activity

The most significant result which emerged from the tests is that there was comparatively little difference in the pectinesterase activity between products heated at 150°F. and 210°F. This indicates that although there is a relationship between enzyme activity and cloud stability, other factors are involved, the nature of which at present are unknown.

There are indications that the soluble solids content has an effect on cloud stability, particularly the sugar and citrate concentration. In other words, the variation of cloud stability with variation of concentration of orange juices is definitely associated with changing concentrations of sugar and citrate. It is unlikely that the mechanism involves an effect on pectinesterase activity.

Dehydrated juices

A further development in citrus juice processing is the dehydration of concentrated juice to yield crystalline powder which can be kept indefinitely at normal temperatures.[3] This involves continuous dehydration by short applications of heat in a high vacuum under carefully controlled conditions. Essential oil and flavours were absorbed in a solid medium, and the granulated product mixed with the powdered concentrate.

A further development is the production of flavour powders by locking orange oil into granules. This is done by emulsifying the oil in molten dextrose or sucrose and cooling, grinding and evacuation of the product. A minor proportion of corn syrup solids is included to inhibit crystallisation. This research is being continued with a view to still further improving the sealing process.

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[2] R. B. Guyer, W. M. Miller, O. W. Bissett and M. K. Veldhuis, *Food Tech.*, 1956, **10**, 40, 57, 570, 663.
[3] H. Fox, FOOD MANUFACTURE, 1956, **31**, 8, 338.

PLANT AND EQUIPMENT FOR THE SOFT DRINKS INDUSTRY

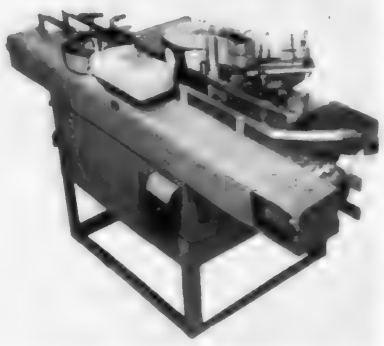
Citrus Processing Machinery

Orange peel chipping machines, shredding machines and splitting or separating machines for use in the production of fresh flavour soft fruit drinks are supplied by Wm. Brierley, Collier and Hartley, Ltd.

Although it is primarily for marmalade manufacture, the chipping machine is used in the soft drinks industry for cutting quarter or half caps of orange and other peels into thin slices which are processed to draw off the fresh flavour of the peel. The shredding machine separates the white pith or albedo from the peel and simultaneously shreds the red part of the peel, expressing the essential oil of the peel. The amount of oil collected from peel varies according to the type of fruit being shredded. Users have reported yields varying from 36 to 170 oz. of fluid from 112 lb. of peel.

The splitting or separating machine separates the white pith from the red or yellow skin of citrus peel. Quarter caps of peel are fed on to the conveyor, which automatically passes them through feed rollers to an adjustable splitting knife at a rate of about 2 cwt. per hr. Subsequent processing is usually by pulverising or solvents, according to the product.

B.C.H. also supply orange washing machines, quartering and peeling machines, screens, sieves and riddles.



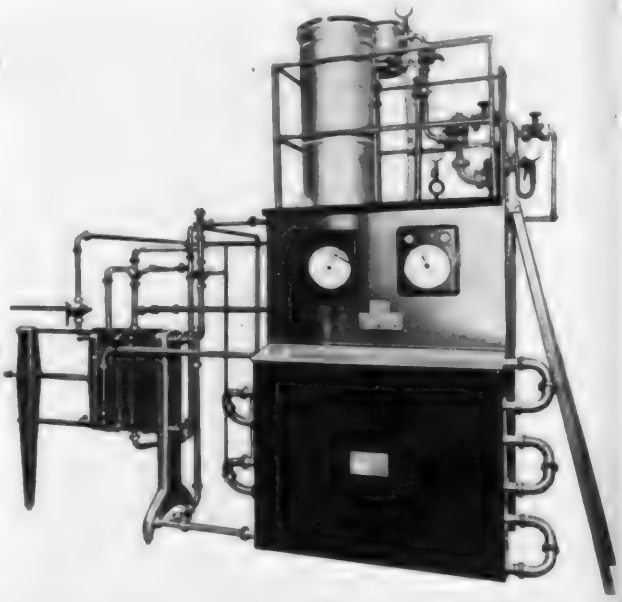
Automatic conveyor type labeller.

De-aeration and Pasteurisation Plant

Deterioration of fruit juices can arise from a number of causes, all of which, claim the APV Co., Ltd., are controlled or prevented by their combined plant for continuous de-aeration and H.T.S.T. pasteurisation. Juice is de-aerated and pasteurised at source to minimise the risk of fermentation, even though sulphur dioxide may be present in the juice during storage. It is also considered advantageous for the juice to be again de-aerated and pasteurised after mixing with sugar into squashes or cordials. De-aeration and pasteurisation of fruit juices or squashes is said to retain the vitamin C content while preventing discoloration when the juices are exposed to sunlight during shelf storage. "Cloud effect" in citrus juices is also maintained.

APV claim that the infection due to micro-organisms is safely controlled by pasteurisation, which also inactivates ascorbic acid oxidase and enzymes which destroy pectin, without any serious effect on the natural fruit flavour of the juices being treated. In processes where enzymes are added to produce clarified fruit juices by destruction of pectin, further action must be prevented and short-time pasteurisation can ensure this. Loss of ascorbic acid is due to oxidation, and to prevent this the fruit juice is de-aerated before pasteurisation. All surfaces which come into contact with the product are of polished stainless steel, so that any possibility of metallic contamination is eliminated.

The plant is designed to process natural strength juice which can leave the machine as (*a*) hot juice with or without partial cooling, for filling into cans without preserva-



The standard APV fruit juice de-æration and pasteurisation plant.

High Speed Bottling Plant

Bottling plant for dealing with an output of approximately a quarter of a million 4-oz. bottles of soft drinks per day. The design of this unit is based on the passage of materials in a straight flow through the factory where the main building is a long rectangular shape, with loading bays at each end.

The Dawson "Supreme Hydro" bottle washing machine seen here is made 40 bottles wide and is served by a case conveyor. The cases of empties are loaded on to the conveyor and as they move in front of the machine, the bottles are taken out and placed on to the semi-automatic feed board, from which they are automatically transferred into bottle holders travelling through the machine.

The washing process consists of a pre-rinse, followed by three re-circulated detergent washes, a re-circulated warm water wash and a final mains rinse. After the mains rinse, the bottles are drained and automatically discharge on to a double-lane "Dawson" bottle conveyor feeding two separate filling and capping lines. After filling and capping, the two lines combine for pasteurising on a continuous machine with feed and discharge at the same end. This is accomplished by the introduction of a 3 ft. dia. rotary combiner. For the final body and neck labelling operation, two machines are used, one a twin tandem and the other a triple tandem, and again the bottles are divided into two lines by a 3 ft. dia. rotary filer. After labelling, the bottles are discharged on to single-lane bottle conveyors, each fitted with a 3 ft. dia. rotary accumulating table, from which they are packed into cases.

During the process, the empty cases will have arrived at the packing end of the line from the case conveyor. This case conveyor after having left the washer passes underground and eventually returns to the ground level again at the packing end of the line.

Two units as described above are installed and several of the items of plant are mirrorised for convenience of layout. The bottle conveyor and accumulating table, together with the bottle washing machines, are made by Dawson Bros., Ltd.

tive, or for passing forward to a concentrator or (*b*) cooled juice for filling into bottles or storage tanks with added preservative. Where the product is to be cooled 60 to 80% of the pasteurising heat can be recovered by regeneration. The plant will handle citrus juice for filling into barrels providing it has previously been screened. It will also handle juice screened for concentrating or canning.

The standard plant is for a capacity of 400 gal. per hr. A modified version is available with a minimum of 130 gal. per hr., and special plant can be supplied with a maximum of 1,000 gal. per hr.

A stainless steel instrument panel carries a recording thermometer on which the temperature of pasteurisation is continuously traced, and a sensitive alarm system gives audible warning of any deviation in pasteurising temperature beyond predetermined limits.

Where pasteurisation only is required, the de-aerator is by-passed by manipulating the juice control cocks.

Straining Fruit Squashes

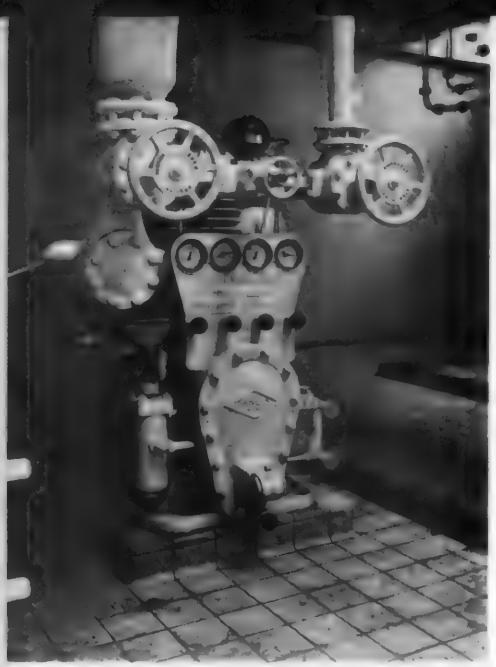
One of the difficulties in the manufacture of comminuted fruit squashes, where maximum concentration is obtained by pulping the whole fruit including the outer skin, is straining because of the high ratio of solids content (about 40%). The pulp, comprising a mixture of whole fruit, water and glucose, is pumped over a sieve through which the liquid passes, and the solids are liable to build up on the mesh, necessitating constant interruption of the process whilst the sieve is emptied out.

Russell Constructions, Ltd., have now adapted their stand machine to overcome this difficulty and claim to have raised output and obtained a maximum quantity of liquor from the fruit.

Fitted with a $\frac{3}{4}$ h.p. 1,400 r.p.m. motor, this stand model recently strained 600 gal. of pulp in one batch, the pulp residue left on the screen being reprocessed and passed through the straining machine again. The batch, including re-cycling, was accomplished in 35 min. The same machine, fitted with a suitable mesh, has a throughput of 1,000 gal. per hr. when straining the sugar glucose used in the manufacture of fruit juices.

Automatic Labeller

An automatic conveyor type single body labeller is made by J. W. Flower and Co. (Engineers), Ltd., for round bottles. Known as the *Eclipse*, it is of the kind which, when a bottle is presented for labelling, extracts the first label from the label box, gums



This UDEC 2-cylinder refrigerating compressor at Beechams Foods, Ltd., helps in the processing of "Lucozade."

that label and then rolls it on to the bottle.

The machine is fully automatic and does not need an operator. The label box can be reloaded by the operator who is inspecting and crating the bottles. There are no gummed surfaces to wash at the end of the run and the legs of the label box do not get gum on them as gum is only applied to the labels themselves. The gum box itself is detachable and easily cleaned.

The machine has a capacity of up to 4,500 bottles per hr.

Crating and Decrating

Automatic bottle crating and decraters are made by U.D. Engineering Co., Ltd. The decrater transfers bottles from crates, cases, etc., on to a multiple slat table, from which they travel to the bottle washing machine. The decrating cycle begins when a loaded crate enters the machine. The crate is raised clear of the moving conveyor to the bottle gripping heads, which transfer the bottles in a straight line on to the driven slat discharge table. Meanwhile the crate is lowered and discharged from the machine.

The crater automatically assembles filled bottles from the filling or labelling machine and deposits them into empty crates. The pressure of the bottles triggers the gripping heads into action. The bottles are transferred to a position above the crate conveyor and an empty crate is raised until they are practically resting on the bottom of the crate, when they are released. The crate is lowered to conveyor level and moved away, and another empty crate is positioned ready for the next cycle. Both machines have a rated capacity of 12 crates per min.

Bottle Conveying Equipment

Mechanical handling equipment for the bottling industries made by H. Pontifex and Sons, Ltd., includes power chain, bridge and portable conveyor installations, and elevators and lowerers of all types with automatic feeds. Their latest type bottle conveyor incorporates a bottle sighting device, comprising a magnifying lens mounted in an adjustable frame with an anti-glare, diffusion, opaque front piece. Two fluorescent tubes comprise the lighting unit.

The conveyor itself is fitted with oval guide rails (for minimum contact with the bottle) which are adjustable to pre-set positions for various bottle sizes. The conveyor can be driven either by an infinitely variable speed drive, or by a geared drive which can be set to a predetermined speed. All drives are totally enclosed, so that no water or foreign matter can enter the gear box, and are mounted clear of the floor on a single leg stand. The tops of the turntables and links are supplied in stainless steel (or other materials if required) and the links are carried on removable bronze wearing strips and returned on the underside of the channel on plastic wearing strips, so that they are totally enclosed the whole time.

Ransomes overhead load guard fitted to the "Forklift 10."

CO_2 Reducing Valve

Pontifex also make a carbon dioxide reducing valve for use with cylinders. The valve is made in three types for low, medium and high pressure. In normal circumstances the valves will not freeze up but, for continuous use and when large quantities of CO_2 are delivered, a copper warming canister with an electric heating element and simmerstat control is supplied.

The same company supplies an air cooler and cleaner to operate when compressed air is used for top pressure on filling machines or as a motive power for transporting the beverage during various operational stages. The compressed air contains a certain amount of moisture and oil in vapour form when leaving the air compressor and it is claimed that, by the use of the cooler, a large proportion of the water can be removed. The air is cooled down to the temperature of the cooling water and is thoroughly cleansed.

Corrosion Resistant Floors

Almost every industry is subject to corrosion in one or more forms, and certainly the soft drinks industry is no exception. Both the raw materials handled and the finished product can give rise to severe corrosion of the factory floors, with the inevitable result of interrupted production schedules, etc. The provision of corrosion-resistant floor surfacings has been studied by the Industrial Division of Semtex, Ltd., with the result that it is now possible to provide surfacings which meet the varied requirements of the industry, namely:

(i) The surfacing should be resistant to spillages of all the materials used both in the production

Q. A. Compounds

A new quaternary ammonium compound, B.H.C. 2008, has been developed by the British Hydrological Corporation for the general sterilisation of plant, equipment, stoppers, etc. All Q.A. compounds operate by adsorption of the molecule on the organisms to be killed. This property of adsorption to surfaces, however, sometimes causes difficulties in the removal of the final residual film of Q.A. compound. While this residual film is sometimes of great value in that it protects the surface against reinfection, in many cases it is undesirable. B.H.C. claim that their new preparation, while maintaining the fullest possible bactericidal qualities, is completely rinsable from all surfaces with ordinary mains water after the sterilising procedure. This is illustrated in the photograph, which shows (left) a tube rinsed with ordinary Q.A. and (right) a tube rinsed with B.H.C. 2008.

They say that it is often possible for a solution of B.H.C. 2008 to be left in contact with the surface to be sterilised overnight. All that is required in the morning, before the first run, is for the solution to be drained off and the plant flushed through with cold mains water. B.H.C. 2008 can be used either hot or cold.

of soft drinks and in ancillary operations such as bottle washing.

(ii) The floor should be clean and attractive in appearance and should not present any hazard to plant personnel (*e.g.* it should be non-slip). In addition, it is necessary that the floor surfaces should be easy to maintain and clean.

Experience has shown that acid-resisting tiles bedded and jointed in suitably resistant mortars possess the above properties. On the question of design it is essential that adequate provision should be made for rapid drainage of spillages, and that all projections from the floor (*e.g.* plinths, bases to plant, etc.) should be protected in the same way as the floor itself.

Acid - resistant tiling work carried out by Semtex Ltd. Industrial division at the C.W.S. mineral water factory in Liverpool.

Stabiliser for Industrial Trucks

An overhead load stabiliser, specially designed for the soft drinks industry, has been developed by Ransomes Sims and Jefferies, Ltd., for use with any of their fork lift trucks.

The stabiliser is a simple, automatically operated clamp. As soon as the weight of the load is taken up by the forks, the device automatically closes down over the top of the load, and is secured by the front lip, which is positioned to suit the particular load. When the forks are relieved of the load, the guard automatically rises to its original position, and the truck can be moved clear. When the length of the load varies, either the position of the front retaining lip can be adjusted, or more lips can be added. When the width of the load is constant, obviously the load can be still further steadied by side lips if desired. The arrangement is entirely automatic and it is not possible for the driver to omit to release the guard when withdrawing from the pallet.

Beverage Filtration Equipment and Its Management—1.

By George B. Beattie

The mechanisation of soft drinks manufacture and other branches of the beverage industry is particularly apparent in the field of filtration. In this article the author surveys filtration problems and reviews the equipment available for dealing with them.

IT DOES NOT seem so long ago that syrups in the average soft drinks factory were filtered by gravity flow through swansdown or felt "bags" and the beer bottler depended almost exclusively on "pulp." In these and other branches of the beverage industries today, filtration has been fully mechanised, and a wide selection of suitable methods and machines is available.

Very generally the filtration problem has the following phases:

1. Filtration of the product itself.

2. Filtration of constituents of the product or of intermediates of that product, *e.g.*, for a clear fruit cordial, filtration of sugar syrup and the fruit juice or concentrate separately. In some cases, water filtration comes within this division.

3. Water filtration where the water is used for purposes other than the constitution of the product itself, *e.g.*, as a rinse for bottles, cans, casks, drums, etc.

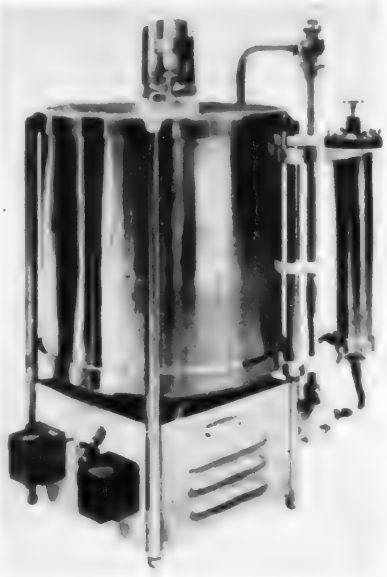
4. Subsidiary purposes, such as filtration of the bottle-washing detergent solution, filtration of CO_2 for use in carbonated products or filtration of atmospheric air to provide a sterile air counter-pressure or a blanket surrounding a bottle or can filler to obviate infection of the product.

5. Filtration, etc., of "bottoms," waste salvage, etc., for recovery purposes.

6. Laboratory filtration for analytical and research purposes.

Soft drinks

We have to recognise at least four different types of soft drink in dealing with filtration problems:



Clayton cold process syrup maker.

i. carbonated ready-to-drink beverages commonly known as mineral waters,

ii. still ready-to-drink types,

iii. clear cordials, and

iv. cloudy cordials or squashes with cell material.

For ready-to-drink beverages, especially of the first type, "syruping" is a usual technique, that is to say, each bottle is dosed with a fixed volume of concentrated flavoured- or juice-containing "syrup," the container then being filled up with carbonated water or—for still goods—plain, highly clarified water. In a few cases "pre-mixing" is applied, even with carbonated goods, the product at final strength being passed through the carbonator, but so far this is much more popular in the U.S. than in the U.K. In general, therefore, for carbonated ready-to-drink beverages, two types of filtration have to be considered, viz., syrup filtration and water filtration. In special instances other phases have to be included, such as fruit juice clarification when specially brilliant effects are desired or where depectinising enzyme treatment, etc., is given, or again, when the product has undergone fermentation, *e.g.*, in the case of "Hop Bitters"; but most of these are beyond the scope of this paper.

Syrup filtration

Up to the First World War this was almost invariably conducted by gravity drip-bag methods, which required rather cumbersome tiered arrangements of syrup tanks. By introducing force or suction pumps, or in some instances very simple stator/rotor patterns, all operations can be reduced to one level, various closed types of filter assembly being used. These are usually cloth and paper, but cellulose-asbestos sheet types, asbestos fibre on gauze, kieselguhr, etc., are also employed. In some cases the filter forms part of the mixing unit; in others a more or less separate filter is utilised. Some of the most widely employed systems are as under:

1. Combined mixing and base sited filter plate. In one well-known example,[1] a 50 gal. stainless steel cylindrical tank with domed base is held by a 4-legged frame over a pair of ½ h.p. electric motors, one for the agitator, the other for the rotary gear-type vacuum pump of 6 gal. per min. capacity, which is driven by belt from the motor, and other accessories compactly grouped. The vacuum filter unit comprises a perforated filter disc

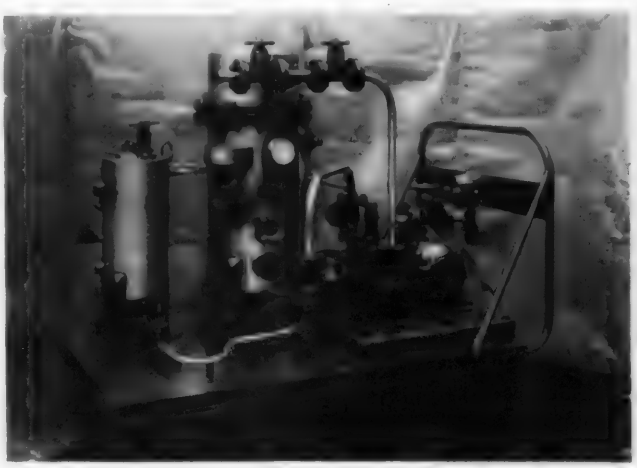
Bratby and Hinchcliffe combined 50-gal. syrup mixer and filter.

covered by a cloth and felt filter assembly, the whole being instantly detachable, while the agitator is a side-operated stainless steel disc. The interior of the tank is highly polished and fitted with a calibrated rod showing gallonage at all depths. In use, cold filtered water is run in, the agitator motor started and the sugar added. As the sugar begins to dissolve, the vacuum pump is started up, on which the solution is drawn through the felt and cloth pad and continuously returned to the bulk in the tank. This recirculation is continued for about 20 min., after which a faucet switch is made which enables the filtered syrup to be pumped to any required flavouring tank. Two full batches can be dealt with from start to finish in 1 hr., without use of heat. In practice, "syrup" varies in density from about 20° to 66° Brix, and, where light syrups are usual, capacity may be increased by making up a heavy stock syrup which on discharge is diluted as required by addition of filtered water.

2. Mixing units with filters placed separately from the mixer. This type, employing cloth, felt, or cloth and paper filters, is very widely used. They are arranged for unit batches of from 40 to over 200 gal. Several different makes are available, but in general, although design details vary, the syrup is made by mixing sugar and water by a fixed or portable motorised agitator in the mixing tank, the completed syrup being drawn from the base of that tank to the filtering unit, which is equipped with a suitable pump, usually self-motorised. In one type[2] the filter case is a vertical cylinder which contains a stout interior meshed cylinder on which the filter cloth fits, the top of the cylinder being sealed by an end cap with fly-nut fixing; all contact parts are made in acid-resisting stainless steel. When a cloth has to be changed, the instantly detachable end cap is removed and the slip-on filter cloth replaced over the perforated inner cylinder as the old one is removed. The standard unit here is of 100 gal. capacity.

3. Types with separate filter linked permanently to the mixer. In one very well-known make of mixer/filter,[3] 50, 100 and 200 gal. models are offered, each batch taking ½ hr. from start to finish. The tank is in polished stainless steel, supported on tubular legs of the same material, and the agitator is of the high-speed type direct-coupled from an overhead motor mounted on a bracket pivoted for easy removal and cleaning. The filtering and pumping unit is mounted at the side of the tank, the filter being a tall vertical cylinder of a stainless steel with heavily tinned gunmetal fittings. The filter "bag" may be changed without emptying the vessel, while the positive rotary pump is driven from a motor sited under the mixing tank. A two-way cock is provided so that recirculation may be obtained, or when it is turned to "discharge" the filtered syrup is passed to the flavouring pan(s). Pumping unit and motor are totally enclosed.

In another equally well-known make[4] the vacuum filter is sited in a slightly oblique position below



"Stellar" filter installation made by Paterson Engineering Co.

the stainless steel mixing tank provided with a graduated gallonage strip and a side-fitted Monel propeller near the base, the latter being inclined towards the propeller, thus assisting turbulence as well as drainage.

Two ¼ h.p. motors, one for the mixer, the other for the syrup pump, are located below the tank. Two sizes are made, 60 and 100 gal., and an inclined chromium-plated front panel carries the switches, detachable filter cover and a vacuum gauge which shows when the filter needs cleaning, thermal overload trips being incorporated to protect the windings. The rotary pump is of acid-resisting alloy, all its pipes being of pure tin. Of 5 gal. per min. rating, it is provided with a 3-way cock on the discharge side, which allows recirculation or instant discharge to the flavouring tank(s). The filter is placed on the suction side of the pump, thus providing, as with example 1 above, a certain amount of de-aeration of the syrup. It consists of a perforated inert metal cylinder around which a filter paper and swansdown cloth are wrapped, the whole being securely locked against jointing rings by a large wing-nut attached to the end cover. By closing an isolating valve on the tank outlet the cloth and paper may be changed while the mixing operation is proceeding.

Other syrup filters

Although various cloth, felt and paper filters are still the most popular in aerated water manufacture, a wide variety of other filter media are also coming into use. Kieselguhr gives very satisfactory results and is increasing in importance in this field. The ring-column style has been adapted to syrup filtration.

The standard *Meta* syrup filter range runs from 1·5 to 10 sq. ft. filter area, with capacities of from 15-45 to 100-300 g.p.h., according to syrup density, at approximately 25 p.s.i. pressure. A typical assembly[5] is mounted on a wheeled bogie with self-contained motor and pump, above which is a Monel or stainless steel domed cover surmounted by a pressure gauge and carrying the ring-column assembly,[6] the members being so arranged that bottom delivery of filtrate is given. The correct weight of filter aid is recirculated with some syrup until a bright filtrate issues, after which discharge is deflected to the flavouring pan(s). Absorption and adsorption are so low that it is practicable to filter syrup *after* it has been flavoured. This is often helpful, but with most alternative media too much flavour is retained by the filter.

The *Stellar* filter[7] is used for beer, water, etc., as well as for syrup. The filter element comprises a cylindrical fluted former with a fine cut screw thread throughout its length, a stainless steel wire being wound around this element to form a foundation for the filter aid, the liquid depositing the particles in the precisely gauged space between wire and flutes. A small amount of kieselguhr is introduced and recirculation conducted for a few minutes, a brilliant discharge occurring as soon as the bed forms. Cleaning is by back-washing, but a special air-trap system above and below the element plate, known as the *Autopact*, assists the process, very little liquid being required. At the end of a run the outlet valve is closed, compressing the filter case air, then the inlet valve is also closed, after which the trapped air is vented, air pressure forcing the liquid in the elements through at high velocity, forcibly throwing down the sludge, which can be withdrawn through a special valve. Sizes up to 16,000 gal. per hr. are available, the large ones being used in the industry for the bottling water, the smaller capacities for syrup.

Other forms of kieselguhr filter are also employed in the syrup room in concert with quite a variety of pumps. Orthodox rotary and gear styles are much used, but lately the *Mono*[8] pattern has been adopted with great success for ring-column and other filter aid syrup filters.

What are termed "Alluvial" filters are very suitable for some syrup room work, and the writer recalls some of the pioneer types by Seitz about the time of the First World War. These were effective, but as the meshwork was in tinned copper, it was not long before acidified syrups became badly contaminated with copper. As gauzes may now be made of stainless steels, Monel, Inconel, nickel, etc., according to the particular usage, this drawback has disappeared, providing the prospective user states his requirements clearly and in detail when ordering. The basic principle has been said to be that of the Gooch crucible enormously magnified,[9] and comprises the deposition of asbestos fibre or an asbestos-cellulose admixture on fine wire gauzes, which in turn are supported by some stronger members such as perforated plates. The method is to run into the filter case a volume of the liquid to be filtered which about fills the case after the filter medium — duly weighed — has been thoroughly whisked up with this initial charge of liquid. A little extra liquid is allowed to flow in while the drawn-off syrup or other liquid is returned, this being repeated until a brilliant filtrate runs through, the gauze having by then been completely coated with a thin film of consolidated asbestos or mixed pulp. Apart from tiny laboratory models, comparatively small cylindrical models operating by gravity, or in a modified form with top pressure lid, are made having an overall range of from 20 to 550 gal. per day output.[10] A rectangular pattern with a different style of gauze element[11] is made in a large range of sizes for gravity or pressure lid (+7·5 p.s.i.) operation, the daily output running from 130 to 3,700 gal. A further group, which may be supplied in a variety of materials, including stainless steel, has its members mounted on wheeled bogies and provides outputs of from 800 to 24,000 gal. a day.[12] They may be operated purely by gravity under the "head" of the feed liquid from a fair height, or may be pump-operated.

Finally, in the alluvial class, there is an interesting type of disc

Two Carlson "Hercules-Regent" filters.

filter, which can be operated with loose media or with a pre-formed asbestos/cellulose sheet, but this is more suitable for liquids of low gravity such as fine wines or spirits than for syrups.[13]

Sheet filters, including those employing *Sterimats*,[14] are suitable for syrups, provided the right grades of sheets are used, and where a sterile syrup is required a dual filter press with a roughing sheet in the first section and sterilising sheet in the second is very helpful. However, grades must be carefully chosen with due reference to density and viscosity. For general bright cordial production a combination of *Sterimat* C1 or C2 with C5 would usually give a yeast-free product. With prior sterilisation and a heavy syrup, CC/04 might well be used for speed.

One point which, perhaps, has not quite had the attention it merits is the obvious one that when syrups are hot they are "thinner," hence filter more easily. Whenever the hot process is used, filtration should be undertaken at as high a temperature as is practicable. Active carbon purification is sometimes undertaken when raw or partly refined sugars are used, but carbon filters are seldom used, it being more common to employ finely powdered carbon and agitation in the bulk, followed by syrup filtration through cloth and paper, etc., using filter aid.

Water filtration

In the soft drinks industry the filtered water is used in the actual product; in many other beverage industries water, *per se*, is chiefly filtered for final rinse purposes, etc. So far as the bottling water itself is concerned, the main classes of filter used are:[15]

1. Cloth and paper in various designs.
2. Kieselguhr.
3. Rapid sand filters.
4. Candle types, chiefly compressed kieselguhr, but ranging from porous porcelain to charcoal.
5. Sheet, mat and plaque patterns.
6. Carbon purifiers.
7. Carbonated water filters which normally are placed between carbonator and filler and may be of cloth and paper, asbestos plaque or other types. These are auxiliary filters.
8. Alluvial filters.

The cloth and paper type which is most general in this country is the "disc" pattern, which is normally worked under mains pressure, but can be operated from an elevated store tank or one on the same level equipped with a pump. A troughed disc, with drainage cock, is in the horizontal plane at the top of a stout pillar, and on this is erected a circular member carrying quick-coupling hinged bolts, while a complementary top disc with reinforcing ribs has peripheral housings for the bolts, enabling tightening-down to be performed in a very short time, this top piece being hinged to enable the filter discs to be inserted. These normally comprise a top and bottom cloth with one or more compressed cotton fibre or filter paper circles to be held between the cloths. The cloths are washable, but the cotton or paper members are renewed each time. While such filters will function at very low pressures, to secure a good output 15 or 20 p.s.i. is advisable, ratings for the three general sizes at the latter being 100, 200 and 660 gal. per hr. Such filters are often quite suitable for handling municipal supplies, but are not germ-proof and have little effect on colloidal matters. Peaty waters tend to clog them rather quickly.

Kieselguhr filters on the ring-column principle in various metals are available in all sizes from small 3-pack models to 12,000 gal. per hr. sizes. In most cases the ring-column packs are protected by gauze sleeves which allow intermittent flow without disturbance of the filter-bed. They operate at pressures of from 10 to 100 p.s.i., and probably are most usually coupled direct to the water main. The injector method is not usually employed, the charge of filter aid being mixed with a little water and the dispersion poured into the filter case, the supply turned on, and the first runnings flushed to waste pending the issue of a brilliant filtrate. Cleaning is by back-washing, preferably with a little pre-filtered water, while collected sludge is drained off through a special door or cock. Pump operation is also practised, especially where mains pressure is low. A simple formula for the calculation of normal output in gallons per hour is $G = 100F$ to I, where G is gal. per hr. output, F filtration area in sq. ft., and I the same in sq. in. Thus, in a filter of 5 sq. ft. filtering area: G=

(5 × 100) to (5 × 12 × 12) = 500 to 720 g.p.h. Much, of course, depends on pressure and something on the supply. Moulds, yeast and bacteria are quite appreciably reduced, but the action on the finer colloids does not seem to be great.

The *Stellar* kieselguhr filter previously noted is also very widely used for water treatment, sizes from 25 to 16,000 g.p.h. being available.

Where the water contains undesirable colloidal dispersions—which cause delayed "in bottle" sediments and CO_2 gushing—prior coagulation with sulphate of alumina or other coagulant is usual, the water then being passed through a rapid sand filter, which depends for its efficiency on the formation of coagulant surface film of alumina hydrate formed by the alum and calcium carbonate. Properly managed, rapid sand filtration greatly reduces the bacterial count and virtually eliminates the dispersed colloids, but great care is needed in controlling the filter rate and coagulum residue, and to promote even distribution a suitable strainer[17] is essential. Cleaning is very important, and, in addition to backwashing, periodic sterilising by approved methods is required.[18] In most cases chlorination is used, a suitable break-point residual being left in the water from the coagulating basin as supplied to the filter, and sometimes for safety super-chlorination, followed by active carbon treatment, is added as a final phase.

"Candle" types are very freely used as polishers, mainly following some other mode of filtration. They comprise cylinders of compressed material, usually fine kieselguhr, closed at the bottom, with a screwed fitting taking a wing or other nut and washer at the top by which a number of these units can be attached to a "saucer" of metal which is seated against a flange of the cylindrical filter case, the cover of which is usually slightly domed and has an outlet pipe rising from it, the inlet being generally low down into the side of the filter case. The water is forced under pressure through the walls of the candles and rises up their interiors to the dome of the case, passing therefrom through the outlet pipe. With care, water can actually be sterilised by means of these filters, which are often on that account known as "germproof." They were developed from the *Pasteur-Chamberland* "biscuit" type by *Berkefeld*, but are now supplied by several firms.[19, 20, 21, 22] Cleaning is greatly facilitated and the length of run increased if a little loose kieselguhr is placed in the case each time, thus preventing clogging. Carbon and other candles of non-germproof type are sometimes used for special purposes, and some U.S. filters which may be said to belong to this group use much larger stoneware cylinders.

Practically any type of sheet, mat and plaque filter may be used successfully for water clarification, as can 2-stage types using kieselguhr on sheets in the first compartment and sterilising or other sheets in the second. A recently introduced circular mat, 12·25 in. dia., 2-stage filter with self-contained motor and pump, is being widely used for water as well as other liquids and is very compact. Its average output is 15 to 20 gal. per min.[23]

So-called carbon "filters" using activated carbon should not be used as filters, for they are much more effective in removing off-tastes and odours, chlorine or, in conjunction with pre-chlorination, iron, when the feed water is pre-filtered to brilliancy. They consist of cylinders with dielectric linings, packed with granular activated carbon, the filtered water passing through them at a suitable rate; and should always form the last link in the water treatment chain. They are particularly useful when phenolic or chlorophenolic impurities are present, but are also effective in eliminating excess Cl. and the odour of algal oils. The older types of carbon (charcoal) filters were very liable to infection and are now seldom encountered.

Carbonated water filters are sometimes placed between carbonator and filler, especially for soda water syphons. Gauze, cloth and paper types or small sheet, mat or asbestos plaque patterns are the most widely used. The technical objections to their use may outweigh any advantages, and with a proper primary water treatment routine and cleaning schedule they might be redundant. Alluvial filters[9-12] give excellent results as water filters and are very handy when one has to operate from a water storage tank under a relatively low "head."

Wines, spirits and cider

For the clarification of wines and spirits before bottling, the most usual filter is a sheet or mat type,[24] although both kieselguhr and alluvial patterns are also used. Both square and circular sheets and mats are employed, models with from 1 to over 100 sheets being specially designed for the wine trade. In one well-known range the *Junior* model is made in from 2 to 8 plate (20 to 60 gal. per hr.) sizes, 8 in. dia. sheets, with or without a semi-rotary pump; the No. 1 size with from 1 to 9 × 12½ in. square plates, 25 to 150 gal. per hr.; the No. 2, 16 in. square, 11 to 19 plates, 210 to 400 gal. per hr., and the No. 4, 16 in., 40 cm., 31 to 61 plates, 500 to 1,200 gal. per hr., a small horizontal single sheet type—which can also be used with loose asbestos, etc.—also being available from the same people. A number of different types of pump can be supplied.

In another range,[25] 20 cm., 40 cm. and 60 cm. sheet types are supplied with or without a self-contained motorised pump in respectively from 4 to 12 plate sizes, 4 to 30 and 40 to 80 plate sizes, giving outputs from 12 to approximately 4,500 gal. per hr. Liqueurs and spirits are dealt with similarly and a wide range of sheet types are designed for the different classes of beverage; thus K7 for gin, brandy, etc., K5 for light white wines, gins, pale sherries, whiskies, brandies, K3 for ports, other red wines, dark sherries, heavy white wines, rum and liqueurs, K2 for very heavy wines and rums, syrupy liqueurs, a dif-

ferent range similarly assorted being provided for gravity filters. For alluvial filters, too, there are several grades of filtermass, and it is important to choose the most appropriate one for the product and filter type. A 2-stage machine is particularly valuable in handling wines and ciders for bottling, providing roughing and polishing or clarification and sterilisation in one unit.

For fruit juices,[26] several techniques are utilised. In the early stages cloths with filter aid are commonly employed to remove slimy pectinous matters with or without enzyme treatment, but when possible early to mid-stage clarification by ring-column or other kieselguhr filter types saves greatly on labour, and for large outputs the injector plan has obvious advantages. With wines or ciders a relatively rough filtration is often advantageous at a comparatively early maturation stage with much closer filtration on bottling. Centrifugation is also largely used, and ring-column, mesh or press pattern kieselguhr filters are very popular.

For cider, Warcollier[27] mentions a number of filters not commonly encountered here, his translator Charley pointing out that pulp (preferably rag pulp) is much used in England, and in his addenda recommending prior centrifugation during the fermentation process.

A pulp filter by Geo. Adlam and Sons Ltd., a special sheet filter by British Filters Ltd., with the plates coated with Prodor-Glas (J. C. Carlson Ltd.), *Seitz* types, the *Stellar* and *Metafilter* kieselguhr types, and a *Johnson*[28] plate and frame pattern using cloths and filter-aid, are specially mentioned. Warcollier asserts that for very thick ciders a cloth filter is the only suitable one, and appears to like pulp filtration. Of kieselguhr filters, he says they can completely inhibit fermentation of cider of 1·045 s.g. which has been keeved for a month; filters using mineral matters being regarded as providing a sterile product.

For unfermented juices, near-sterility is necessary for "in bottle" stability, and while this is often obtained by pasteurisation, sheet or mat filtration secures the same result without altering palate characteristics. Double stage filters of metals which can be rapidly steam sterilised are usual, though cold chemical sterilisation is often used. Clarifying and sterilising mats or sheets are employed in tandem, while in some instances a roughing-out run through a kieselguhr filter precedes the dual sheet filtration. With either cider or unfermented juices, filter layout is important.[29]

Metafilter for syrup, showing dome, pump and motor on portable trolley.

Auxiliary filters mean that either the filter is not used to clarify the product itself or is employed in a subsidiary capacity. It has been shown[30] that with the normal washing temperature and detergent concentration, sterile bottles can be produced in orthodox modern bottle-cleaners without subsequent sulphiting, etc., provided the warm and cold rinses are by sterile liquors. Machines using sheet filters for both warm and cold rinses and also a small sheet filter to purify the air around the discharge end are now available.

Air filters and conditioning plants abound, and where the bottling plant can be partitioned off so that the process takes place in a conditioned atmosphere, many reinfection problems are solved. Laboratory filters are available in great variety. Small cylinder patterns using loose asbestos, etc., 1-sheet mat or pad types of small diameter, active carbon miniatures, single "candle" types, bacteriological funnel or flask filters using *Filterit*, *E.K.*, etc., media, sintered stainless steel types[31] and *Metafilter* types are much used, while the value of the "membrane" filter[32] in the drinks laboratory has recently been emphasised.

Reclamation of products from precipitates is an important phase. For wines or cider small sheet filters with large turbid chambers are often used, up to 50% wine being extracted from the lees. Warcollier suggests a combined filter/centrifuge for cider. For beer, centrifuging is popular, but some types of kieselguhr filter are claimed to be quite efficient.

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CONCENTRATED APPLE JUICE

Composition, Manufacture and Uses in Foods

By R. S. Potter, B.Sc., F.R.I.C.*

Concentrated apple juice provides a natural flavour base for soft drinks, confectionery, table jellies and many other products, and upon it any flavour can be built. Incorporation into existing recipes is usually simple, and there is no distinctive apple flavour, the juice merely acting as a carrier for the appropriate flavour.

APPLES HAVE received their fair share of attention by workers in many research fields, including cultural methods, control of pests and diseases, the production of both fermented and unfermented apple juice, and the manufacture of pectin. On the other hand, little attention has been given to the production of concentrated apple juice as a raw material for food manufacture, where the product is finding application in a very wide field.

Before considering the process and methods of production, it will be of interest to review briefly the essentials with which Nature provides us in the form of "the apple," and to see the all-important role which Nature plays in facilitating, or otherwise, the process of manufacture.

The apple

Whether Nature intended the apple to be the instrument of the original temptress, or even that the fruit should form a part of the diet of humans at all, must be open to doubt, but most certainly Nature never intended man to extract the essential components such as juice and pectin! On the other hand it must be admitted that Nature has been kind to the manufacturer of both concentrated apple juice and pectin, insofar as the apple is unique in having not only a high proportion of pectin, but that the pectin is present almost entirely in an insoluble form (protopectin), so that the juice can be extracted in an almost pectin-free condition. This is the reverse of many fruits such as raspberries and blackcurrants where a high proportion of the pectin is present in a soluble form in the juice, which makes the pressing, clarification and depectinisation a much more difficult process.

Like other fruits, apples vary enormously in their composition, not only from variety to variety, but from year to year, and also during the ripening process, and these variations are of fundamental importance to the manufacture of concentrated apple juice. Apart from flavour (which is mainly governed by the particular variety of apple used), one of the most important factors is the percentage of soluble solids. The percentage of "water" in apples is fairly constant irrespective of variety and degree of maturity and is about 82-86%, so that the quantity of juice which can be pressed from apples is also fairly constant and is usually about 160-170 gal. per ton of fruit. The specific gravity of the juice, however, may vary within very wide limits, depending on the variety, the season, and the state of maturity of the fruit. Under-ripe cull apples, such as Bramley and Lord Derby, may only yield a juice of about 1030 s.g., while ripe Cox's Orange Pippin may yield a juice of 1050 or even higher. Again, the acidity of the juice may vary considerably. Matured Bramleys may yield a juice of 1% acidity (as Malic) or even higher, whereas many dessert varieties such as Cox's Orange will only yield an acidity of 0·5%. In addition to the wide variations in soluble solids and acidity, there are other variables of a more nebulous nature to be considered, such as flavour, tannin content and colour—the latter two factors being interconnected through the complex oxidase system in the apple.

From the above it will be seen that an important part of the process is that of blending the juice either before, or after, concentration, in order to obtain uniformity in the finished product. Another variable factor, caused by the biochemical changes in the apple during the process of maturing, is the gradual increase in the solubility of the pectin. In under-ripe fruit practically the whole of the pectin is present in an insoluble form as protopectin, with the result that the juice contains very little pectin in solution. As the fruit ripens the protopectin becomes hydrolysed into the more soluble pectinic acids, which is part of the normal process of ripening. When fully ripened fruit is used for the production of concentrated apple juice, the amount of pectin in the juice is sufficient to form a firm jelly during concentration. For this reason the juice is always treated with a pectin-destroying enzyme (pectinase) in quantities commensurate with the amount of pectin in the juice.

Process of manufacture

In practice almost all varieties of apples can be used for the manufacture of concentrated apple juice, with the exception of crabs and the bitter-sweet varieties which are too astringent in taste and product a very dark juice. Normally there are sufficient of the high acid varieties such as Bramleys Seedling and Lord Derby, which provide a juice of very desirable flavour characteristics, to blend with juice from the sweeter

* Managing director, William Evans and Co. (Hereford and Devon), Ltd.

Pressing apples for manufacture of concentrate.

varieties such as Cox's Orange, Princess Pippin, Worcester Pearmain, in order to give a balanced finished product. The process of washing, sorting and pressing is carried out on standard equipment used for cider, where the fruit is crushed in apple mills and the pulp is built up into "cheeses" and pressed in hydraulic presses. Unlike cider, however, there are one or two important points which require special attention. If juice of good colour is required it is essential that contamination with iron should be avoided, since even a few parts per million of iron in the juice will accelerate the natural enzymic darkening. Secondly, it is essential to process juice immediately it is pressed.

After pressing, the juice is screened through a vibrating screen carrying a 200 mesh stainless steel gauze. This removes any pieces of apple which may be present, and any coarse particles, and the screening facilitates the subsequent process of filtration. The juice is then ready for depectinising, and for this process it is pumped, for convenience, into a series of 3,000 gal. rubber-lined tanks for the enzyme treatment. It will be appreciated from earlier comments that the amount of enzyme will require to be varied within wide limits, but generally between 2 and 4 lb. of enzyme per 1,000 gal. of juice is sufficient to depectinise at room temperature in about 3 hr. Fruit which has been held in cold store gives a juice which is very viscous owing to the increased solubility of the pectin, and a very considerable increase in the amount of pectinase is necessary in order to depectinise the juice. In practice the amount of enzyme necessary can be determined fairly easily by simply following the destruction of the pectin by viscosity measurements.

The depectinised juice is then filtered bright, either using pulp filters or Metafilters. In either case the use of a fine grade of filter-aid material is necessary, the filter having been pre-coated with the same material. The filtered juice is then evaporated in multiple effect evaporators to produce a final product containing about 70% of soluble solids. Generally the forward process is used whereby the unconcentrated juice is subject to the higher temperature at the lowest vacuum and the product is finished off at much lower temperatures at a high vacuum; the temperature in the finishing pan rarely exceeds 120°F.

Concentrated apple juice is often referred to in terms of its concentration, for example 10 to 1, or 8:1, but it will be appreciated that owing to the large variations in the soluble solids of the natural juice such terminology can be very misleading. It has therefore become more customary in recent years to define the concentration in terms of the soluble solids as determined by the refractometer, and the most generally accepted standard is 70% solids. To the ultimate user of the product this is of much more practical interest than the actual degree of concentration, since he can calculate more accurately the quantities of natural apple sugars and acid he is adding to his product. A typical analysis of concentrated apple juice is as follows:

Specific gravity ..	1320
Soluble solids % ..	71·1
Acidity (as Malic) % ..	7·6
Invert sugar % ..	45·6
Sucrose	12·3

Uses of concentrated apple juice

Grape juice, both fermented and unfermented, has long been recognised as a valuable flavouring base in foods, and the chef of many an ancient Royal Household knew the value of such additions. Apple juice has very similar properties, and acts as a carrier for other flavours. Some manufacturers of concentrated apple juice carry out the concentration in plant equipped with an ester-recovery system, whereby the volatile flavours of the apple, typified by the ketonic esters, are returned to the concentrate. Where concentrated juice is intended for use as a raw material in food manufacturing, as opposed to its reconstitution as a drink, it is a matter of opinion as to whether the recovery of the esters is, in fact, an advantage. A bland concentrate, with only a faint aroma of apples, is probably a much better base than a concentrate which has retained its full complement of low-boiling esters. In fact, attention is being given to a process of "refining" which involves treating the juice, prior to concentration, with activated carbon, which not only produces an extremely bland tasting concentrate, but also reduces the colour to a pale straw-coloured syrup. This will un-

doubtedly extend the field of use of concentrated apple juice, by permitting its use in products where colour is an important factor.

Concentrated apple juice is finding a wide field of application in manufactured fruit products, including soft drinks. It is well known that many products such as boiled sweets, table jellies, and fruit-flavoured centres for chocolates would be insipid and almost flavourless if the manufacturer relied solely on the natural fruit juice. On account of this it has become standard practice to fortify the natural flavour with appropriate synthetics or natural oils. On the other hand, such products flavoured solely with synthetics and natural oils are very thin-tasting on the palate and lack fullness of flavour. Concentrated apple juice provides the fruit juice base upon which any flavour can be built.

In most products the use of concentrated apple juice involves merely its addition to an existing recipe, due allowance being made for the apple sugars, acid and water introduced. In general it can be assumed that concentrated apple juice has a 10:1 concentration factor, so that the addition of 10% of concentrate to an existing recipe does, in fact, represent 100% of straight juice.

In table jellies, for example, the concentrated apple juice is usually added after the soaked gelatine has been dissolved in the sugar syrup, and the addition of ½ gal. of concentrated apple juice per 100 lb. batch will produce tablets which contain 50% of pure apple juice. The effect of this proportion of fruit juice in the jelly is most marked, and gives a fullness of flavour in the made-up jelly which is immediately apparent on the palate. When using concentrated apple juice, however, the normal quantities of sugar and acid will require to be reduced so as to allow for the amounts introduced by the apple juice.

In boiled sweets, pastilles and chocolate centres, concentrated apple juice—usually representing about 5-7% of the total boil—should not be added during the sugar boiling process, since it is not only apt to cause undue foaming, but it will affect the inversion. It should be added at the end of the boil at the same time as the synthetic flavour and colour, but it will probably be necessary to boil to a slightly higher temperature in order to allow for the water added with the juice.

Another increasing use for concentrated apple juice is in fruit squashes. Legally, squashes must contain a minimum of 25% of the fruit juice named on the label, and when it is considered that the ultimate consumer probably dilutes 1 vol. of the squash with 5 vol. of water, it will be seen that the finished drink will only contain 5% of fruit juice. The addition of only 2½% of concentrated apple juice, of 4 oz. to 1 gal., doubles the minimum fruit juice content of the drink and produces a much fuller flavoured product. There is no distinctive apple flavour, the apple juice merely acting as a carrier for the appropriate citrous flavour.

In thick fruit sauces, where the main basic ingredients are dates, raisins and tamarinds—usually referred to on labels as "rich oriental fruits"—concentrated apple juice has been found to be a useful supplement to these more expensive materials. Additions of about 5% of concentrate to an existing recipe have been found to show a marked improvement in the fullness of flavour, and a remarkable characteristic is that the spice flavours are much more pronounced than before the addition of concentrated apple juice.

The above examples will serve to show the wide applications of concentrated apple juice in the food manufacturing trade, and it is not surprising that this valuable raw material is finding increased use in almost every type of food and drink which is based on a fruit flavour.

Continuous Production of Fruit Juice Powders

FOLLOWING the development of a successful but relatively expensive batch technique for the production of powdered apple and grape juice products using vacuum shelf drying, V. A. Turkot *et al.* of the U.S. Dept. of Agriculture's Eastern Regional Research Laboratory, have worked out a continuous process for dehydrating fruit juices (*Food Tech.*, 1956, **10**, (12), 604).

Powdered sweetened concentrates of apple, grape and cherry juices have been continuously dried on a pilot-plant scale with a production rate of 30 lb. per hr. The concentrates are dried under moderate vacuum and a high temperature to a moisture content of 2 to 2½% in a special type of evaporator while remaining in a molten state. The evaporator—the most important piece of equipment in the process—is a vertical jacketed cylinder containing a rotating agitator fitted with three straight blades. These blades clear the wall by about 0·030 in. and keep the material being processed in a thin turbulent film against the wall. The concentrate is pumped out of the evaporator, mixed with a metered quantity of high-fold essence (1 gal. of which contains the aromatic volatile flavouring constituents of about 1,000 gal. of fresh juice) and chilled quickly on rolls to form thin brittle flakes which, after crushing, constitute the final product.

The equipment required is considerably less expensive than either vacuum shelf-driers or the continuous belt, high vacuum type of drier and is available as standard commercial units. The products are claimed to have good flavour, colour and aroma, and their keeping qualities at room temperature and at 100°F. (37·8°C.) are expected to be the same as those of the corresponding vacuum shelf-dried products, which are excellent. Besides their use for reconstituting to beverage, the powders can be used to contribute natural fruit flavour to prepared dessert mixes and to form the base for dry fruit jelly mixes.

Below: **Like a string of giant beads, sweets emerge from the forming machine on to the cooling turntable.**

BLUE BIRD TOFFEES

By Norman Brampton

Sir Harry Vincent, founder of the "Blue Bird" confectionery company, was a pioneer in the creation of first-class working conditions in the food industry. The factory pictured above, set in 160 acres at the foot of the Clent hills in Worcestershire, was built over 30 years ago and it is still a model of its kind. Here over 500 people are employed making toffees and boiled sweets for all markets.

THE dominant impression given to the visitor at Harry Vincent's confectionery factory at Hunnington, near Birmingham, is spaciousness. The factory is situated in the North Worcestershire countryside near the little town of Halesowen. It is spread on a level plateau, with wide views all round.

The whole of the 100,000 sq. ft. of working space is on one floor. The result is the absence of cramped conditions, confined lifts, narrow stairs, precipitous slopes, and tunnel passages with hurrying men pulling laden trolleys, which are the accepted conditions in so many factories, which like Topsy, "just grow'd."

These works were planned very carefully in the light of a lifetime's experience in the confectionery trade, by the late Sir Harry Vincent, the founder of the business, and his son Eric, the present managing director, before they moved out of Wiggin Street, in the centre of Birmingham, in 1925.

The factory was sited in the heart of a 160-acre estate to give a sense of space and to ensure a steady and uninterrupted flow of raw materials and products in parallel lines from north to south, from the stores receiving bays to the despatch deck.

The goods intake is on the receiving bay to the right or north side of the works. Goods from all over the world arrive here—cane sugar from the West Indies, beet sugar and condensed milk from various parts of the United Kingdom, butter, dried fruit, and honey from Australia, licorice from Turkey, nuts from Spain, Italy, and India, coconut from Ceylon, and peppermint and citrus oils from Italy, and the U.S.

Glucose and palm kernel oil are delivered in bulk by tankers and pumped direct into storage tanks.

Parallel with the receiving deck is the stores and weighing room. Here butter, sugar, glucose, and flavours for a toffee mix are weighed and measured, and placed in large metal buckets.

Sugar boiling

In the main room of the works is situated a battery of about a dozen steam-jacketted sugar-boiling pans of polished copper, with capacities ranging from 1½ to 2 cwt. The ingredients for a particular mix are poured into the pan and then boiled for about 12 min. at 260° to 280°F., depending on the kind of toffee being made.

The boiled toffee is given the usual cold water test to get its range between the small ball stage and the hard crack state. It is usual to put the moist flavouring ingredients into the mix before

Levelling molten toffee on the cooling table.

boiling, and to add the solid ingredients, such as dessicated coconut or preserved ginger, after boiling.

An expert sugar boiler can recognise ten distinct stages as the sugar passes from the syrup or melting point stage, up to the point where it turns brown and a state of caramelisation is reached. The sugar reaches the syrup stage at 215° to 220°F., and becomes caramel at approximately 350°F. Within this range the different degrees have long standing traditional names: Thread, Pearl, Blow, Feather, Small Ball, Hard Ball, Soft Crack, and Hard Crack.

If a sample at the small ball stage is dropped into cold water from a wooden spoon, and then rolled between the finger and thumb, it forms a ball and comes away from the finger and thumb easily, whereas at an early stage the boiled toffee would cling, and as the finger and thumb were parted it would make a thread. The soft crack stage is reached at 280°F., and if a sample of boiled toffee which has reached this stage is dropped into cold water, it will crackle, and when taken out will be firm and brittle.

The toffee boiling section is separated from the rest of the wide manufacturing bay by a clear glass hood, which descends from the roof to within 10 ft. of the floor. Between the outer white glazed walls and this glass partition, there is a ventilation system, which ensures that no steam seeps through into the main workroom.

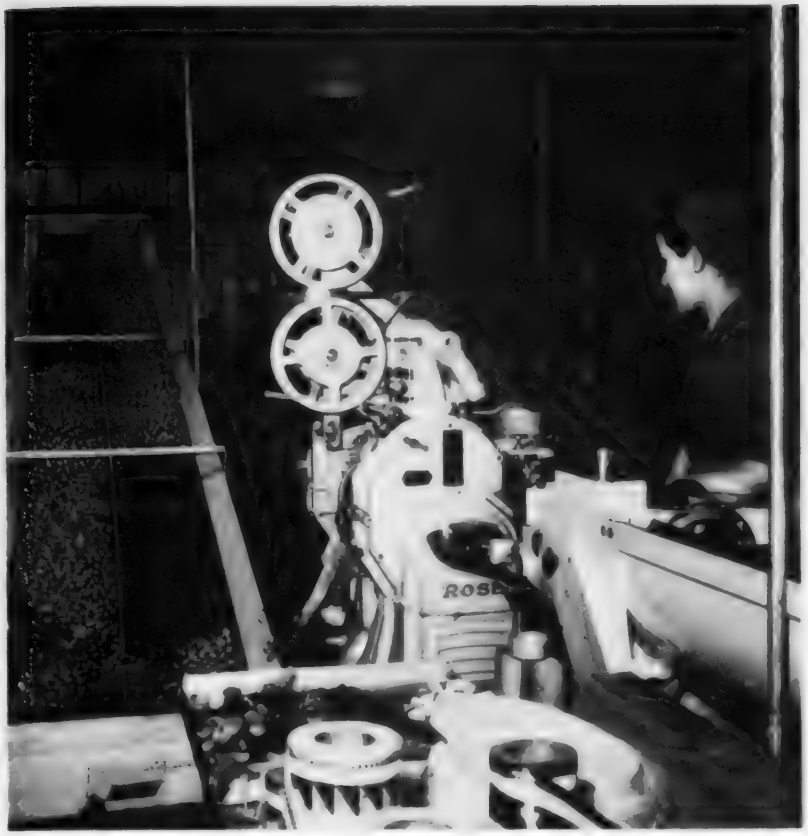
Cooling and shaping

Each boiling kettle serves a steel cooling table which is kept at a low temperature by a water-cooling system. When a mix has been properly cooked, the boiling toffee is poured on to the table after steel-bar fenders have been placed all round it. A levelling gauge, the width of the table, is then run down the steel fenders, and this spreads the toffee to an even and level thickness.

When it is cooled sufficiently, deft-handed girls, wearing the blue caps and overalls which are the customary protective clothing for women in the works, cut the toffee with circular wheel cutters, into pieces about 16 by 18 in., and then turn them over to cool the other side.

When the slabs of toffee have been cooled further, they are taken off and put under a machine which has a carefully guarded stamping plate that sections the oblong slabs into caramels.

Toffee received from the line of copper boiling pans against the wall is poured on to water-cooled tables for levelling and forming.



High speed machine for forming and wrapping toffee.

The caramels are shaken loose, and after sieving, are conveyed to a battery of wrapping machines, each of which is capable of handling 150 toffees a minute. They are then dropped into metal pans, and these wrapped sweets are moved over to the nearby packing section.

In a variation of the caramel-shaping process the caramel is not cut into slabs, but loosely rolled as soon as it is cool enough, and lifted into batch rollers. These are ribbed and operate by pressing against the caramel in cone formation, gradually reducing it to a rope-like form sufficiently cooled to be fed direct into a cutting and wrapping machine. These shoot out the wrapped caramels at the rate of 650 a min., on a rising conveyor, which completes the cooling and carries the brightly coloured stream of wrapped caramels into pans in the packing department.

Some of the cooling benches in the department are reserved for the licorice rolls. The mass from which these are made is put into a vertical hopper, which reduces the soft dark mass to little finger thickness, and passes it into the waiting wrapper, where it is encased in its wrapping with the characteristic black and silver foil, and carried away in a gleaming silver stream on a belt to the packing tables beyond.

Humbugs

The firm do not make the usual black and white humbugs, but they produce a striped brown old-fashioned mint humbug, with a soft centre, in the high-boiled confectionery department, where mint and fruit-flavoured sweets with soft centres are made.

Like the caramels, these sweets start off in the sugar boiling pan, and after being poured on to warm tables, undergo a rather more complex process which ends with a neat blending of three kinds of boiled sugar. Around a cylindrical mass of toffee, fruit pulp, or other form of centre, an outer coating of boiled sugar is wrapped. Sometimes this is striped, and to make the rich golden brown stripes for the mint humbugs, flavoured boiled sugar containing butter is pulled on a hook in the traditional manner or by machine, and set in with the darker stripes to make the outer casing.

The bold striped mass, looking like a jester's coat, is put into the batch roller, which reduces it to the customary rope with neat pale gold stripes. Then it is fed into a machine which fashions it to the required shape, usually oval, and it emerges like a string of outsize beads. After travelling over air-cooled bands, it is deposited on to revolving trays, where it is cool enough to break off into individual pieces ready for the wrapping machines.

Most of the sweets for the home market are twist wrapped with viscose film, but bundle wrapping is often done for overseas customers. Fold wrapping is used for foiling square caramels. The only unwrapped sweets the firm produces are packed in ½-lb. or 1-lb. airtight lever lid tins.

Chocolate processing

Some of the caramels are coated with milk or plain chocolate in cascade enrobers of a modern type, which are linked in a continuous flow with a gas-type cooler, from which chocolate-covered caramels emerge, firm and ready for the wrappers.

The latest department to be installed, just off the main block, is the air-conditioned chocolate moulding department, where chocolate Neapolitans of various flavours are made. The plant is the design of a Danish firm, and it is worked with a continuous flow on the conveyor belt system.

The liquid chocolate is pumped overhead from a mixer through a pipe which fills an automatic tempering device, from which the liquid chocolate is run into the metal moulds which pass beneath it. The moulds move on to the usual shaker for levelling and bubble eradication, and then straight into the cooling chamber,

from which they emerge ready to be knocked out of the moulds.

They are then fed into the wrapping machines, which apply a lining from a continuous band of foil, and an individually cut outer wrapping. This small plant is capable of producing nearly 250,000 Neapolitans daily.

Packaging

The blending, weighing and packing department has a fascination of its own. Vincents are firm believers in the adage that we begin to eat with our eyes, and all the firm's goods are covered with bright attractive wrappers, or their own colours are permitted to gleam through transparent wrapping papers.

The packing department has moving belt units, where the smaller tins and cartons are filled and conveyed to the girls who put them into the cardboard outers and seal them.

In the stock room, next to the packing department, orders are assembled and sent out, mainly by van, to customers in many parts of the British Isles. The firm also do a substantial export trade with over forty overseas countries.

The large store of non-returnable and fancy tins and wrappings is situated in an outer building connected by a wide conveyor to the works. Here round drums with the firm's Blue Bird skimming across the lid are stacked besides tiers of gay tins with pictures of children and dogs, embroidery designs, and seaside views. Over a million tins were filled and delivered for the last Christmas season.

Jar washing

This rear building also houses the rotary jar washing, rinsing, sterilising and drying machine. Empty jars are placed on wire retainers on a conveyor belt which takes them through the interior of the plant, during which old labels are removed and the jars thoroughly cleaned inside and out, sterilised, dried and returned to the point where they were fed into the machine. Some 400 jars per hour are dealt with by the machine.

Air-conditioned Neapolitan department. These machines wrap chocolate Neapolitans in aluminium foil and outer strip wrappers at the rate of a quarter of a million a day.

Laboratory control

The laboratory is in charge of Mr. F. A. Oliver, B.Sc., F.R.I.C. Its main function is to keep control of the quality of all raw materials and processed confectionery; also to conduct storage and packaging tests on wrapping materials and finished goods. Such routine tests as the determination of covering chocolate fluidity, candy tests on sugar and liquid glucose, melting points of hydrogenated oils and fats, and moisture contents of dairy butters are regularly carried out. In addition, the finished confectionery is checked against standard Blue Bird recipes by estimating the moisture content, the glucose, fat and butter percentages of production samples.

The administrative block of the factory forms the well-balanced front of the building, with two massive Doric columns which form an arched entrance. Passing through a dignified entrance hall, and mounting a broad marble staircase, visitors come to a wide corridor. On one side are well-lit offices, and on the other a sweeping view over the main part of the works.

The building to the south of the main factory, behind a well-kept lawn and garden, is the canteen and recreation block. Here the work's dining-room is situated. Near the works is a sports ground.

The factory is surrounded by a model village, which was built by the firm as part of the whole enterprise when the move was made in 1925. Here live some of the key employees.

This is indeed a family business. Sir Harry Vincent started the firm when he left his native Evesham as a young man. He saw it through several changes in Birmingham as it required more and more room. In 1923, the business was converted into a limited company and Sir Harry was joined on the board by his son Eric. After the death of Sir Harry in 1952, the business was converted into a public company, with Mr. Eric Vincent as chairman and managing director. One of his sisters is also a director.

Sir Harry Vincent was very well known in the Midlands for his work for various hospitals. His contribution to the founding of the Queen Elizabeth Hospital, by personal service and gift, was particularly outstanding.

SOME SUPPLIERS OF MACHINERY

Baker Perkins, Ltd.
Bramigk and Co., Ltd.
Brierley, Collier and Hartley, Ltd.
Dawson Bros., Ltd.
Forgrove Machinery Co., Ltd.
Fisher and Ludlow, Ltd.
Mikrovaerk A/s.
Rose Bros., Ltd.
Maison Sapal.

Glyceryl Monostearate in Food

By S. Cressey*

Glyceryl monostearate (G.M.S.) is one of the most widely used bread-improvers. While its improving effects are generally not so pronounced as those of polyoxyethylene monostearate (see FOOD MANUFACTURE, 1956, 31, 7, 277), the question of its safety has not caused so much controversy. Here is an outline of the composition, properties and uses of G.M.S. in food products generally, with particular reference to theories about its effects in bread.

Composition

THE substance sold commercially as G.M.S., is not pure glyceryl monostearate, the approximate composition being:

	%
α-Glyceryl monostearate	30–33
Glyceryl di-stearate	45–47
Glyceryl tri-stearate	20–23
Free glycerine	3–5
Soap (from alkaline catalyst)	

However, it is the α-glyceryl monostearate part, which is mainly active, and it has in fact been shown by Feuge[1] that diesters have only very feeble emulsifying properties.

Glyceryl monostearate containing up to 98% of the mono-ester is available, but is not so widely used as the type whose composition is given above, and it is to this latter "Commercial G.M.S." that we shall refer for the remainder of this article.

The two main methods of preparation of G.M.S. are by esterification of glycerol B.P. by triple pressed stearic acid (actually a mixture of stearic and palmitic acids) or by hydrolysis of a triglyceride such as hydrogenated tallow. An alkaline catalyst, generally caustic soda, is used and this accounts for the soap present in the final product. Average analysis of a typical G.M.S. is as follows:

Acidity	1·5%
Saponification Value	155 mg.
Melting Point	56°C.
Iodine Value	2·5

These figures vary widely with samples from different firms.

The structural formulae isomers of G.M.S. can be represented as:

$CH_2OOC(CH_2)_{16}CH_3$
$CHOH$
CH_2OH
(β monoglyceride)

CH_2OH
$CHOOC(CH_2)_{16}CH_3$
CH_2OH
(α monoglyceride)

CH_2OH
$CHOH$
$CH_2OOC(CH_2)_{16}CH_3$
(α monoglyceride)

according to which OH group of the glycerol reacts with the stearic acid. It is found in practice that β monoglycerides are not present in any large amounts, and indeed the main method used to determine the monoglyceride content of a substance (the periodic oxidation method) gives only the amount of α monoglycerides present. Small proportions of the β monoglycerides can however be present in monoglycerides prepared by the usual industrial techniques, as has been shown by G. Y. Brokaw *et al*[2], who calculated the amounts as 5-8% of the total monoglyceride content. This low proportion of β monoglycerides requires some explanation if the general view that all 3 −OH groups of glycerol have equal chances of being esterified, is accepted. Theories have been put forward that the formation of β monoglycerides is inhibited by steric hindrance from the surrounding −OH groups, but that when formed, they are protected against glycerolysis for the same reason, so that these effects should just about cancel each other out, and the problem still remains. Demarcq[3] puts forward the explanation that β monoglycerides are formed at the same rate as α monoglycerides but are spontaneously transformed into the isomer.

USES OF G.M.S.

In bread

The advantages generally claimed to result from the use of G.M.S. in bread, are:

(*a*) Improved keeping qualities.
(*b*) Softer crumb.
(*c*) Better crumb texture.
(*d*) Increased loaf volume.

The keeping qualities of bread are also affected by the temperature at which it is stored as shown by Edelman and Cathcart[4]; these workers found that although G.M.S. and polyoxyethylene monostearate were among the best of 24 different softeners tried, and that bread containing these two substances was softer when stored 12-96 hr. at 10°C. after baking than control bread under the same conditions, it was not as soft as control bread stored at 28°C. They also found that loaves refreshened by heat were not as soft after 48 hr. as unheated loaves containing G.M.S. or polyoxyethylene monostearate.

When used in bread containing no added fats, G.M.S. is generally used as a 16-18% dispersion in water (which must be reckoned as part of the total water), this dispersion then being added at the rate of 3½ lb. per 280 lb. sack of flour. If G.M.S. is to be used in conjunction with fat, it can be

* Croda, Ltd.

melted into this so that the mixture represents 0·3% fat and 0·05 G.M.S. on the flour weight. It should be noticed that the quantity of G.M.S. required is dependent on the presence of other chemical improvers such as ascorbic acid, phosphates, etc., and in this connection two British Patents are of interest.

According to B.P. 700,869, G.M.S. (representing a polyhydric ester of fatty acids) blended with an improving agent of the oxidising and bleaching class *e.g.* ascorbic acid, has a synergistic effect. The ascorbic acid improves the handling properties of the dough, shortens fermentation time and improves fermentation tolerance, while the G.M.S. improves volume, softness and texture. Weights to be used are 0·0005-0·002% ascorbic acid, 0·03-0·15% G.M.S. (expressed as a per cent of the flour or dough mixture) compared with up to 0·004% ascorbic acid and 0·3% G.M.S. which are the optimum amounts when either substance is used alone.

B.P. 588,958 describes a loaf with improved crumb colour, grain texture and keeping qualities, made with a paste containing G.M.S. along with other improvers such as fat, soya, phosphates or bromate, this paste being added at the rate of 3 lb. per 280 lb. sack of flour.

The amount of G.M.S. necessary for optimum effects is also lessened if the flour used has been improved by agene or chlorine dioxide treatment.[5]

Cakes

Use of G.M.S. in cakes gives corresponding advantages to those obtained in bread, *e.g.* better crumb texture, improved keeping qualities, and the opinion has been expressed[6] that G.M.S. is more effective in cakes than in bread. Generally speaking recommended quantities of G.M.S. are 3-6% of the fat weight; 6% is more useful although Jooste and Mackey[7] reported that addition of 3% or 6% did not seem to make any difference to cake quality. These authors also reported that it seemed immaterial whether G.M.S. was dispersed in the water or fat, and attributed its effect to an efficient dispersing action on the fat and air bubbles, and a stabilising effect on this dispersion when formed. The following formulae utilising G.M.S. are typical.

Cake filling	1 lb.
Margarine	8 oz.
Sugar	9½ ,,
Dried egg	2½ ,,
Milk powder	½ ,,
G.M.S.	1½ ,,
Baking powder	½ ,,
Water	12 ,,
Vanilla flavour	½ ,,

The fat and G.M.S. are blended and mixed with half the flour. The egg and sugar are dissolved in about 10 oz. of the water and beaten into the fat/flour mixture for about 15 min. The other half of the flour is sieved with the baking powder and the remaining water added with slow stirring.

Full Egg Sponge

Egg	3 lb.
Sugar	3 ,,
Flour	3 ,,
Water	11 oz.
G.M.S.	½ ,,

The G.M.S. is dispersed in the water and added to the mixed egg and sugar.

Ice cream

G.M.S. is used in good quality ice cream, for the following reasons:

(*a*) To prevent growth of coarse ice-crystals on storage, and to improve consistency and smoothness.

(*b*) To keep the ice cream firm and dry.

(*c*) To replace more expensive products such as egg yolk or gum tragacanth.

The quantity of G.M.S. used in a formulation is very small, say 0·35-0·5%, and the following is a typical ice cream mix formulation:

	lb.
Cream (40% fat)	265
Milk (3¼% fat)	540
Skim milk powder	51
Sugar	140
Gelatine	3
G.M.S.	4

The following formula has been suggested[8] for an ice cream using sweetened baking cream instead of fat and sugar:

	lb.
Full cream milk powder	14½
Sweetened fat	15
Sugar	1½
Soya flour	2½
G.M.S.	½
Sodium alginate	½
Water	6½ gal.

Mock cream

Mock cream fillings are increasing in popularity and G.M.S. has secured a place in these products an account of its ability to absorb large quantities of air, giving substantial volume increase and lightness to the whipped product, coupled with a stiff smooth consistency suitable for piping and decorative work. A light textured cream may be made as follows:

Sugar	2 lb. 5 oz.
Milk	2½ pints
G.M.S.	4 oz.
Water	1 pint

The melted G.M.S. is dispersed in the water at 80°C. with rapid stirring which is continued until the temperature drops to 45°C. when the milk, also at 45°C. is added. The sugar is then added, the cream stirred until cool and then whipped.

J. R. Brunner[9] found that glyceryl monostearate, glyceryl distearate and sorbitan monolaurate, were the most effective of various chemical anti-foaming agents in the condensing of skim milk and whey. It has also been reported[10] that the use of G.M.S. makes it possible to use skim milk in bread with no fat *e.g.* the type baked in Australia. The milk is pre-heated to 180°F. for 30 min. and can then be concentrated, with G.M.S. hydrogenated stearine and potassium bromate being added as an emulsion before drying.

Cocoa type coatings

Work has been carried out to find a cocoa-type coating for army rations in tropical zones, *i.e.* a coating required to stand up to 49°C. for long periods of time and yet remain palatable. Hydrogenated vegetable fats gave a very greasy feeling, but G.M.S. was among the effective emulsifiers found.[11] A further advantage of this emulsifier is that it can help to reduce sticking of the coating to wrappers. The plasticising effect

of G.M.S. has proved of interest in low temperature work, and an edible spread which could be spread with ease at 32°F. but maintained its form at 110-130°F.[12] has been made with distilled G.M.S. as an ingredient.

Canned meats

According to U.S. Patent 2,655,451 adhesion between the outer surface of the meat and the inner surface of the can, may be prevented by covering the latter with a thin film of G.M.S.

This glyceride is also used as a stabiliser for salad cream and margarine and in baker's yeast to prevent lumping and give a clean fracture.

The action of G.M.S.

In ice cream, salad dressings, etc., G.M.S. acts as an emulsifier and stabiliser for distinct oil and water phases. The action of such emulsifiers is well covered in the literature and will not be discussed here. We shall, however, review some of the various theories put forward to explain its softening and anti-staling action in bread.

1. Strandine *et al*[13] examined under a microscope, dough made with coloured fat, and found that the monoglyceride masses are broken up during mixing and dispersed between the starch granules, some becoming chemically attached and forming a loose complex, and others merely covering a part of the granules and reducing their water absorption capacity; this in turn delays the swelling, rupture and collapse of the granules. During baking the granules expand but not so rapidly as when they are free of monoglyceride, so that the decreased water absorption could account for the improving effects, since addition of a fully hydrated gluten to dough during bread making has already been seen to give a loaf which keeps fresher for longer periods.[14] Another factor is that if soluble starch is the cementing substance for the starch granules and gluten strands forming the air cell walls of bread, deficiency (*i.e.* soluble starch being retained within the granules in discontinuous aggregates) will mean decreased rigidity of the cell walls, and decreased firmness of the bread.

2. D. D. Lord in his paper on polyoxyethylene monostearate[15] states that although the shortening effect of fats is very complex, it is related to the ability of the fat to spread over the flour particles in an even film. POEMS and glyceryl mono esters possess this property to a high degree because of their large hydrophilic group, and would be expected to be better shortening agents than the triglyceride fats.

3. POEMS and oleic acid depress the swelling and swelling power of starch and it has been suggested that they cause the starch to be apparently partially stale, so that the bread does not firm so rapidly with age.[15,16] As monoglycerides have the same effect on starch, the same explanation could be applicable.

4. Coppock *et al*[5] state that they do not believe that the above theories explain more than a part of the many factors involved when a softer and longer keeping crumb is obtained by means of a substance added during dough making; the nature of the additive, flour quality and nature of flour oil, mode of baking and subsequent cooling all play a part in the bread's final properties. The same authors go on to report the results of experiments showing the importance of the flour oil and observe that G.M.S. cannot exert its improving effect in the absence of this oil, although even one quarter of the natural quantity is sufficient for the improving action to be restored.

In the course of these experiments, flour extracted with carbon tetrachloride and washed with ethyl ether was used to bake a loaf in which G.M.S. at 0·18% of the flour weight actually *depressed* volume and increased crumb firmness, although in a loaf baked without fat, solvent extracted flour normally gave increased though harder crumb.

In connection with the various other factors involved in bread staling, attention is directed to the work of Alcock and King,[17] who during World War II developed a method to prevent bread staling, using a mixture of three parts paraffin wax and one part of beeswax as the active ingredient. These waxes were added to flour in a fine powder at the rate of 28% waxes to 72% flour, and this agent was then used in the main portion of the flour at the rate of 4 lb. per 140 lb. sack. It was found that the rate of loss of moisture accorded closely with the rate of loss of freshness, and it was concluded that although these are not directly associated, they may have similar origins.

A suggested explanation was that the non-polar character of the paraffin wax inhibited the movement of water between gluten and starch which tends to break the continuity of the gluten film, and at the same time gave mechanical support to the gluten. The gluten was thus less permeable to moisture vapour.

In calling attention to these views on the importance of labile water on crumb properties, Coppock *et al*[5] suggest that the effectiveness of many crumb softeners may be due to their influence on the partition of labile water between starch and gluten in bread due to their hydrophilic nature. They may help the initial retention of moisture in glucose coagulated during baking, which would make them responsible for the initial softness, and then go on to control the rate and method of moisture transference between glucose and starch. This is illustrated by a simple test in which the rate of re-freshening of control bread (*i.e.* with no G.M.S. to restrict labile water movement) is greater than that of bread containing G.M.S. under the same conditions.

X-ray diagrams have been used[18] to study the effect of bread improvers, and it has been shown that fat and emulsifying agents reduce the retrogradation of gelatinised starch in bread crumbs. In this respect G.M.S. was found to be more efficient than T.E.M. (diacetyl tartaric acid ester of monoglyceride) lecithin and fat and the X-rays suggest that these materials delay formation of starch

crystals, possibly because they do not fit into the starch crystal lattice.

Safety of G.M.S.

The question of toxicity must arise for all food additives, but G.M.S. appears to be quite safe in this respect. Kuhrt and Welch[19] have shown the presence of monoglycerides in lard and bread containing lard, and Coppock *et al* demonstrated its presence in flour oil, in the experiments mentioned above; it is therefore concluded that monoglycerides must have been consumed for as long as bread has been eaten. The non-toxicity of monoglycerides has been substantiated by various workers, *e.g.*:

(*a*) Kuhrt *et al*[20] state that ingested lipids in two human subjects were 37·6% and 50% converted into monoglycerides in the intestinal tract.

(*b*) Mattison *et al*[21] obtained similar results working on the lipids recovered from the lumen of rats' intestines.

(*c*) Reiser *et al*[22] found that between 55-75% of C^{14} labelled triglycerides fed to rabbits was hydrolysed to monoglycerides and absorbed as such.

(*d*) Frazer *et al*[23] hold the view that triglyceride absorption through the intestine utilises an emulsion involving monoglycerides.

If the "hundredfold" acceptability test (*i.e.* that a hundredfold increase over the amount normally used in food for satisfactory results, should still be non-toxic) is observed, then G.M.S. is still a safe material. Indeed the safety factor has been placed[5] at a minimum of 250, this figure allowing for the natural monoglycerides present in flour oils, in fats that may be added to labelled goods and monoglycerides formed by decomposition of these fats during baking.

REFERENCES

[1] R. O. Feuge. *J.A.O.C.S.*, 1947, **24**, 49-52.

(*Turn to page 175*)

To The Editor . . .

Potato Flour

SIR,—I was interested to see a paragraph in your February issue (p. 91), dealing with potato flour, obviously intended for the manufacture of some sort of "Crispies." In order to produce a high-class product from potato flour, unrefined potato starch should be used to enhance the flavour of the finished product. The starch should be gelatinised in the known manner by heating its mixture with water and then adding a minute amount of a diastatic enzyme (not malt flour), at a temperature below 55°C. Drying, if necessary, and forming of a slab for slicing, is done in the usual manner.

DR. L. M. HIRCHBERG.

Hull.

Sausage Prices and Sausage Skins

SIR,—The Council of this Association is gravely concerned regarding an article which appeared in a recent issue of the *Manchester Guardian* to the effect that any increase in the price of sausages to the public is attributable to a sharp rise in the price of sausage skins. This is an entirely erroneous statement, showing a complete ignorance of the true facts, and could lead to the creation of a wrong impression throughout the trade and with the general public.

The true facts are that over the past nine months there has been no increase in the price of sheep casings, which are used extensively in the production of chipolata sausages, or thin link sausages, and therefore any increase in the price of these sausages cannot be attributed to an increase in the casing price. While there has been some increase in the import price of hog casings used in the production of the larger type of sausages, this would not justify an increase in the sausage price of more than ½d. per lb.

L. M. ARMOUR,
Secretary,
Association of Gut Processors.

London, E.C.1.

Quaternaries and Corrosion

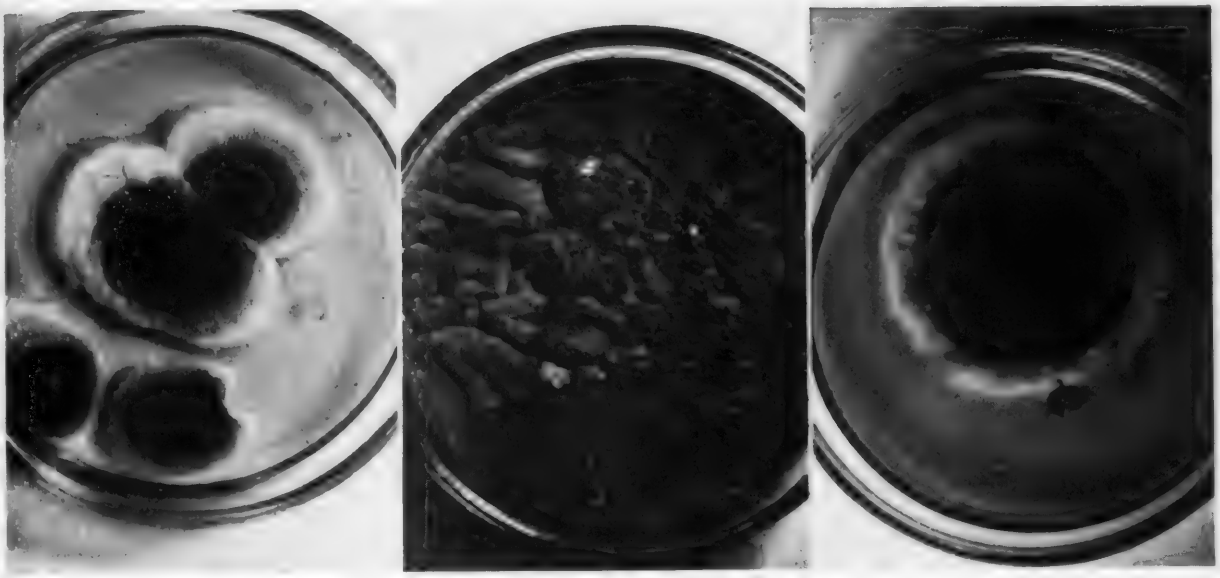
SIR,—We would like to compliment Mr. E. L. E. Humphriss on his very excellent article "Ice Cream," which appeared in the January issue. No one appreciates better than we the author's trenchant wisdom on subjects relating to the dairy and ice-cream industry, but we feel that his reference to the need for a "corrosion-inhibiting quaternary" could lead to a misconception in the minds of less erudite technologists.

As manufacturers of quaternary ammonium compounds we would point out that most of these chemicals are not excessively corrosive in contrast to other sterilising agents. This is confirmed in technical publications, e.g. *Jrnl. of Milk Technol.*, 1942, **5.** (6.) Nov./Dec., p. 343), which, incidentally, confirms the effectiveness of re-use, a point also made by Mr. Humphriss. Dr. C. A. Lawrence discusses this point in his book "Surface-Active Quaternary Ammonium Germicides" and shows that where prolonged soaking of metal surfaces in quaternary solutions is undertaken the incorporation of an oxidation inhibitor—sodium nitrite—is desirable to inhibit rusting. In high concentrations of 10% to 40% some metals are attacked, though not Monel metal and stainless steel. Tin is corroded more by water than by quaternary solution, as is also iron. Lawrence, a recognised authority on the subject, concludes: ". . . the same metals exposed to 0·1% or less of the quaternary ammonium compound in water gave results which confirmed the claims made by the manufacturer that, in the dilutions recommended for use, the germicide is no more corrosive than water."

With the increasing use of quaternaries in the food industry we feel that this information will interest your readers.

H. P. KAUFMANN,
Manager, Chemical Department,
Bayer Products, Ltd.

Kingston-on-Thames.



ETHYLENE OXIDE for Cold Sterilisation

By H. Rauscher, G. Mayr and H. Kæmmerer*

Ethylene oxide gas has been used for many years for insect control. It also provides a useful method of disinfecting foods and packaging materials without the use of heat. Experimental results obtained with this fumigant are given in this article.

GASEOUS substances have for decades been used for the destruction of pests in enclosed places, in particular for the protection of stored products, and for killing germs, *i.e.* for sterilisation. The idea of using gaseous ethylene oxide for sterilising emerged very early, as is evidenced by the patent Schrader-Bossert in 1935—No. 569465 Th. Goldschmidt, Essen. At that time such a process was not urgently required, and it was therefore not industrially exploited.

During the Second World War, American scientists in particular were actively interested in cold sterilisation by the use of ethylene oxide, as is evidenced by a large number of reports published during the last fifteen years. In addition to ethylene oxide, propylene oxide, pure methyl bromide, formaldehyde, epichlorohydrin and ethylimine were tested. For sterilisation, however, only ethylene oxide and propylene oxide have become of practical importance. Both substances are now used increasingly for sterilising medical preparations, instruments, plastic materials and plastic components of all types, and also for foodstuffs, spices and dried egg powder (against *Salmonella*). Apart from fumigating with ethylene or propylene oxide, the treatment of surfaces with aqueous solutions of both substances should not be overlooked.

The experiments which are reported in this paper were conducted in the laboratory and at the research station of DEGESCH (Deutsche Gesellschaft für Schädlingsbekämpfung m.b.H.), Frankfurt/Main.

* Deutsche Gesellschaft für Schädlingsbekämpfung, Frankfurt/Main.

Ethylene oxide as fumigant

The chemical, physical and physiological properties of ethylene oxide are summarised below:

Above. **Some of the organisms against which ethylene oxide is used. Left to right are penicillium glaucum, cladosporum herbarum, and aspergillus niger.**

(a) Chemical and Physical Properties

Molecular weight	44
Freezing point	−111°C.
Boiling point	10·5°C.
Density of gaseous ethylene oxide	1·52 (air=1)
Density of liquid ethylene oxide	0·896 (20°C.)
Explosion limits when mixing with air:	
low	4·3 vol%
high	60·4 vol%

Smell in weak concentrations: resembling chloroform.

Liquid ethylene oxide is a solvent for organic substances such as lacquers; this characteristic does not persist in gaseous form.

(b) Toxicity

Ethylene oxide is toxic to man. The poisonous effect is probably based on the alkylation of free prosthetic groups of certain proteins.[4, 13]

Exact data on the poisonous effect have not been published, even the smallest lethal dosage has not been defined. 1 g./cu.m. is still considered harmless. Solutions of ethylene oxide burn the skin.[12]

(*c*) *Types*

Ethylene oxide can be used pure or mixed with carbon dioxide. Two mixtures are available:

*Etox** (90% ethylene oxide, 10% carbon dioxide, vapour pressure approx. 5 atmos., inflammable).

Cartox, which is known in the U.S. as *Carboxide* (10% ethylene oxide, 90% carbon dioxide, vapour pressure approx. 80 atmos., not inflammable).

(*d*) *Analytical evidence*

Ethylene oxide hydrolyses in water to ethylene glycol. In pure water, ethylene glycol forms very slowly. H-ions accelerate hydrolysis to such an extent that in this way a quantitative determination of the ethylene oxide can be made by titration of the OH-ions which are set free. Broensted, Kilpatrick and Kilpatrick have written an article thereon.[14]

Fumigation plants

For experimenting, we used several glass vacuum apparatuses each of about 6 litres, as well as a vacuum chamber of 2 cu.m. capacity. Our experiments were made with pure ethylene oxide and *Etox*.

The inflammable *Etox* was used in preference to the non-explosive *Cartox* because the former has many advantages. It is economical, smaller quantities of substances can be used, and the apparatus can be kept under vacuum during the whole of the processing time so that no gas can possibly escape from any part of the apparatus, and cause complaints or poisoning. *Cartox* requires a vacuum-pressure apparatus, and during treatment the apparatus is under pressure of several atmospheres. The possibility of ethylene oxide exploding on mixing with air is eliminated in a properly constructed apparatus. At a vacuum of 720 m.m. mercury, ethylene oxide is no longer inflammable, furthermore, there is no ignition element inside a closed apparatus. Ethylene oxide does not self-ignite under practical conditions.

The glass apparatus made it possible to watch the behaviour of the article during fumigation. Measuring instruments for temperature and moisture were fitted. An indirectly-heated vaporiser served for vaporising liquid ethylene oxide.

In the 2 cu.m. vacuum chamber, tests on a large scale were carried out under practical conditions. A vacuum plant (Degesch circulatory system) was used with a horizontal, single-stage sliding air pump, heating equipment, explosion-proof vaporiser and sterile cotton wool filter.

The fumigating process was the same in both cases. A portion of each sample to be disinfected was retained for checking purposes. The samples were placed in the vacuum container packed in such a way that on taking out later re-infection from the outside appeared impossible.

The temperature was measured and the chamber evacuated to about 40 Torr. Directly after attaining vacuum, the required quantity of ethylene oxide was evaporated and passed into the chamber—always with the pump working, *i.e.* during circulation—so that an almost instantaneous and even distribution of the gas to the whole of the chamber was achieved. The gas vaporisation took about 30 sec. each time. With some of the tests, the vacuum was lowered to approx. 20% following the gas vaporisation.

After expiration of the exposure time, the gaseous ethylene oxide was removed by evacuating the chamber two or three times. The air admitted for compensating pressure naturally passed the sterile cotton wool filter.

The sterilised samples were then examined in our laboratory as to bacterial content, or passed on to Research Institutes in sterile packing.

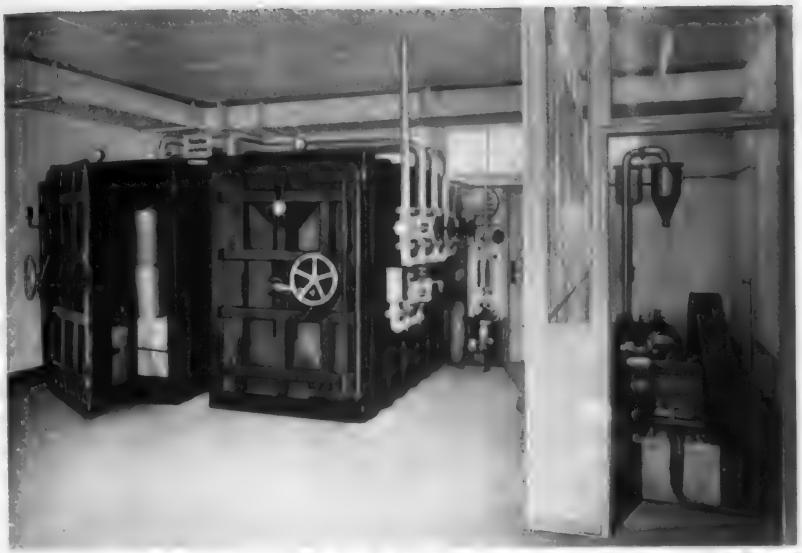
Results of experiments

(*a*) *Vacuum Sterilisation with Ethylene Oxide*

P. M. Cross and L. P. Dixon,[1] Yesair and Cameron,[2] C. L. Griffith and L. A. Hall,[3] S. Kaye and C. R. Phillips,[4] F. Lanza,[5] and H. J. Pappas and L. A. Hall,[6] among others, report on the application of vacuum in sterilising with ethylene oxide. We tested the conditions of vacuum sterilisation, in particular its application to practical use. In disinfecting packed materials—and most of

Apparatus used in experiments on ethylene oxide sterilisation.

* Registered trade mark of the London Fumigation Co., Ltd.



Vacuum fumigation plant (2 x 176 cu. ft.) suitable for cold sterilisation with "Etox" and for disinfection with "Etox," methyl bromide, etc.

the materials disinfected are packed—vacuum is indispensable for achieving sterilisation. The penetrating effect obtained with ethylene oxide under a vacuum of some 95% is very good. Not only sealed cases of dried fruit, or firmly pressed tobacco bales, are penetrated by ethylene oxide under vacuum, but also finely powdered substances, such as flour, starch or spices in cardboard boxes or plywood drums, are completely penetrated and disinfected. The disinfecting effect is improved by admitting air so that there will be approximately 20% vacuum after evaporating and distribution of the ethylene oxide.

(*b*) *Concentration and Exposure Period*

In controlling insect pests by means of gaseous ethylene oxide, different reactions of various insects and/or their pre-adult stages are noticed. It is not possible to give uniform details of concentration for sterilisation. With Gram-negative aerobic bacilli and/or Gram-positive aerobic cocci, as, for example, were found in cigars and cigarettes—250 g./cu.m. for an exposure period of 6 hr. was sufficient for complete sterilisation. It was found that 150 to 200 g./cu.m. were sufficient to destroy all mould spores.

For killing *Bacillus anthracoides*, however, a minimum concentration of 750 g./cu.m. was required with an exposure period of 6 hr.

Type and nature of the germ carrier were very important. Sterilisation of gelatine powder, for instance, always required a concentration of 1,000-1,250 g./cu.m. ; we assume that this is due to numerous micro-organisms contained in the gelatine. Foreign authors give varying quantities, for instance G. W. Kirby, L. Atkin and C. N. Frey,[7]—80 g./cu.m., which according to our experience is far too little, whereas J. M. Baer[8] has used up to 1,920 g./cu.m. which we do not consider necessary for any operation.

Normally, 500 g./cu.m. of ethylene oxide for an exposure period of 6 hr. is entirely sufficient to disinfect the material being treated, provided it is not too thickly layered. However, it is necessary to make quite sure of the type of micro-organism concerned and to carry out suitable preliminary tests before proceeding with practical disinfection tasks, on the result of which possibly depends a great deal.

In almost all cases, an exposure of 6 hr. was sufficient for our experiments. Only when treating heavily encrusted material, *e.g.*, aspic-powder was a better result obtained by extending the exposure period to 7 hr. We do not think a further extension of the exposure period would give better results as no improvement in the final result has occurred in any of our experiments by extending the exposure time to more than 7 hr.

Our experiments confirmed the opinions of the following authors: P. M. Gross and L. P. Dixon,[1] C. L. Griffith and L. A. Hall,[3] J. M. Baer,[8] W. Verhoeven,[9] Ch. R. Phillips and S. Kaye,[4] S. Kaye, H. F. Irminger and C. R. Phillips,[10] A. L. Lepigre.[11]

Improvement in the effect can only be achieved by increasing the concentration, not by lengthening the period of exposure.

(*c*) *Temperature*

The temperature of the treated goods influences greatly the result of disinfection. Below 12°C. no sterilising effect worth mentioning can be achieved with gaseous ethylene oxide. At temperatures of 16°-17°C. mould can be destroyed with sufficient degree of certainty but not bacteria. By employing temperatures of more than 20°C. during the whole of the maximum exposure period sterilisation was always obtained. The optimum effect takes place at a temperature of between 30° and 35°C. It may be that this phenomenon is due to the various temperature optima of the micro-organisms. In this connection the articles by S. Kaye and C. R. Phillips[4] as well as S. Kaye, H. F. Irminger and C. R. Phillips[10] are of interest.

(*d*) *Moisture*

According to our experience, the degree of moisture in the air of the room only slightly affects the result during fumigation. According to S. Kaye and C. R. Phillips,[4] a certain minimum moisture content is essential, otherwise sterilisation is not possible. Variations in the moisture between approximately 15% and saturation point did not influence the sterilisation in our experiments. S. Kaye and C. R. Phillips as well as J. M. Baer[8] arrive at the same result.

Summary

In view of its high penetrating capacity, its inertness to many

materials and its good germicidal effect, ethylene oxide can be described as a very good disinfectant. In the presence of moisture, traces of ethylene oxide change into non-toxic ethylene glycol. By far the greater part can be removed quantitatively from treated goods by repeated evacuation within a few minutes, even if these are contained in sealed, but not gas-tight packing.

Ethylene oxide can be used for disinfecting foodstuffs including all types of spices and dried egg powder, packing materials, and articles made of metal or plastic. It is best used at a vacuum of 95% at the beginning of sterilisation with subsequent decrease of the vacuum down to approximate 20% with maintenance of a temperature of between 25° and 35°C. In most cases, 500 g. ethylene oxide per cu.m. are sufficient; against some micro-organisms it was necessary to use 750 g./cu.m. The fluctuations of moisture experienced in our climate do not influence the sterilising effect.

The effect of ethylene oxide (in g./cu.m. air space) on various micro-organisms is given in Table 1. It is comparatively easy to kill *Clostridium var., Bact. Coli.*, etc., whereas for the staphylococci larger quantities of ethylene oxide have to be used for the same purpose. Only a low concentration of ethylene oxide is required to kill mould fungus.

As shown in Table 2 the sterilising effect is also greatly influenced by the temperature of the goods. Mould can be destroyed at a temperature of less than 20°C., whereas bacteria are satisfactorily dealt with only above 20°C.

Table 3 shows how sterilisation is affected by varying the times of exposure. In most cases, 6-7 hr. at efficient dosages of ethylene oxide will give satisfactory sterilisation. If the dosage is too small, even prolonged exposure will proproduce no satisfactory result. (*Staphylococcus* and *bac. anthracoides.*)

Table 1. Effect of Ethylene Oxide at Varying Concentrations.

Exposure period: six hr.
Temperature approx. 25°C.

	Concentration: g./cu.m.						
	150	250	350	500	750	1,000	1,250
Bact. coli	×	×	×	○	○	○	○
Streptoccocc. sp.	×	×	×	○	○	○	○
Staphylococc. var.	×	×	×	×	×	○	○
Clostridium var.	×	×	○	○	○	○	○
Bac. anthracoides	×	×	×	×	○	○	○
Flavobact.	×	○	○	○	○	○	○
Oidium lactis	×	×	○	○	○	○	○
Penicill. gl.	×	○	○	○	○	○	○
Aspergill. niger	×	○	○	○	○	○	○
Mucor mucedo	×	×	○	○	○	○	○

Explanation of signs: × growth ○ sterile — not tested

Table 2. Effect of Ethylene Oxide at Varying Temperatures.

Concentration: 500 g./cu.m.
Exposure period: six hr.

	Temperature °C.				
	14	18	20	25	30
Bact. coli	×	×	○	○	○
Staphylococc. var.	×	×	×	×	×
Streptococc. sp.	×	○	○	○	○
Clostridium var.	×	×	○	○	○
Bac. anthracoides	×	×	×	×	×
Flavobact.	×	○	○	○	○
Oidium lactis	○	○	○	—	—
Penicill. gl.	○	○	○	○	—
Aspergill niger	○	○	○	—	—
Mucor mucedo	○	○	○	—	—

Table 3. Effect of Ethylene Oxide at Varying Periods of Exposure.

Concentration: 500 g./cu.m.
Temperature approx. 25°C.

	Exposure period in hours						
	2	4	5	6	7	10	14
Bact. coli	×	○	○	○	○	○	○
Staphylococc. var.	×	×	×	×	×	×	×
Bac. anthracoides	×	×	×	×	×	×	×
Streptococc. sp.	×	×	○	○	○	○	○
Clostridium var.	○	○	○	○	○	○	○
Flavobact.	○	○	○	○	○	○	○

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Nutrex Re-equip Laboratories and Test Bakery

NUTREX, LTD., have re-equipped and re-decorated their test bakery in Nutrex House, Maddox Street, London, W.1. Their programme of activity has also been reorganised.

The laboratories are under the direction of Mr. J. E. Hall, the technical director of Nutrex, Ltd., who is assisted by Mr. Alan W. Davies, research superintendent, Mr. R. Macdonald, bakery officer, and Miss Pamela Sidebottom and Miss D. Pearce, technical assistants. Routine analysis, research, and other educational activities, are carried out.

Samples of high protein flour are subjected to a detailed chemical and physical examination before bulk purchase is made and subsequently utilised in the commercial production of vital wheat gluten.

Production control includes the sampling and examination of the material at various stages of production, and routine checks are made on *Nutrex* bread purchased over the counter from bakeries throughout the country in order to confirm the company's advertising claims.

Studies are being made of the chemical characteristics of wheat gluten with particular reference to the distribution of amino acids present and their effect on baking properties.

Experiments to determine the increase in the biological value of wheat protein by essential amino acid supplementation are in progress The influence of natural occurring enzymes of flour on the tensile strength and cohesive properties of gluten is being investigated

Various methods of drying vital gluten—*viz.*, vacuum, spray drying and flash heat systems—are being investigated and comparisons made of the resultant product when incorporated in bread doughs. The preservation of wet gluten is being studied and alternatives to the conventional brine storage are under test.

Commercial production methods of wheat gluten, starch and starch derivatives are being studied and recommendations made to further improve the yield and quality of the company's products. In the field of development, the manufacture of modified starches for specific industrial use, the manufacture of glucose and protein hydrolysates for pharmaceutical purposes and the production of animal feeding-stuffs may be mentioned.

The *Nutrex* Test Bakery has recently been re-equipped and redecorated to bring it into line with the new laboratories. In the bakery the gluten produced in the company's factory at Trowbridge is subjected to baking tests as a complement to the chemical tests carried out in the laboratories. Experimental work is carried out in connection with the evolution of new formulae for bread and the use of starch in confectionery. The effect of varying qualities of flours, yeasts and other ingredients used in conjunction with *Nutrex* gluten in the production of *Nutrex* bread are observed.

Above left. **Drawing a batch of bread from the electrically controlled Simon oven in the Test Bakery.** *Right.* **Operating the "Mono" dough moulding machine in the Nutrex Test Bakery. Also in the picture are one of the Simon thermostatically controlled proving cabinets, the "Artofex" dough kneader and a corner of the weighing-down bench.**

Left. **The analytical section of the laboratories. In the centre of the picture, a technician is seen carrying out a chemical test on flour. She is working on the mobile bench attachment which can slide to form an extension to any area of the bench. The other technician is operating a Simon automatic gluten washer.**

Advances in Food Technology

VITAMIN A

New Source

Vitamin A has been extracted from the Dara fish (*Polynemus indicus*) by scientists at the Fisheries Technological Laboratory, Bombay. The quality of the vitamin A obtained is comparable to that obtained from shark liver oil.

Dara is fished extensively on the Bombay coast, and the viscera and livers are usually thrown back into the sea. A method for the extraction of vitamin A on an industrial scale was worked out by the Fisheries Technological Laboratory, in which the minced liver and viscera is treated with a pick-up oil to produce 4% of an oil rich in vitamin A. Minced liver and viscera were pulped and mixed with refined groundnut oil (as the pick-up oil) and alkali and was steamed in a barrel. The oil that floated out when the steamed mass had settled was filtered, treated with anhydrous sodium sulphate, filtered again and stored.

The oil recovered by this method was found to contain 5,023 I.U. of vitamin A per g. Loss in pick-up oil during processing was 9%.—S. K. Pradhan, V. G. Marathe, S. M. Arsiwala, *J. Sci. and Indust. Res.* (India), 1956, **15C**, 218.

RUSKS

Effects on Quality of Eggs and Lecithin

Research at the German Federal Research Institute for Cereals, Detmold, shows that the crispness of rusks can be influenced by a number of factors, including the manner of working the dough, the use of alkaline or acid mixtures, the kind of flour and baking fats used. Other factors recently investigated are the quality and quantity of eggs, egg powder, lecithin, etc. With two fresh yolks of eggs per kg. of flour, very crisp and tasty rusks can be obtained. Using an entire fresh egg does not greatly improve the quality. Dehydrated egg yolk was nearly equivalent in quality to fresh egg yolk, whilst rusks made with egg powder were in fact better than those made from fresh eggs. Lecithin should be added at the rate of 0·5 to 1·0%, emulsified in water. Rusks of very good quality are obtained with combinations of lecithin-fat mixes with fresh or dehydrated yolk of egg. Good results are also obtained with milk-lecithin powder. The quality of the flour has a great effect on the quality of the rusks.—H. Dörner and E. Tessmer, *Gordian*, 1956, **56** (1346), 17.

CEREALS

Electrochemical Determination of Lipoxydase Activity

During storage grain products are to some extent affected by lipoxydase activity. The effect is partly desirable, partly undesirable, and has not yet been clarified. In any case, it is desirable to obtain an indication of the enzymatic oxidation of linoleic and linolenic acid, and thus the reaction kinetics of lipoxydase activity. Among the methods designed for this purpose is one developed by Professor F. Tödt at the Berlin Research Institute for Grain Products. With this method the oxygen contents are measured electro-chemically with a higher degree of accuracy than with other methods. If there is an enzymatic oxidation of the unsaturated fatty acids, the consequent reduction in the oxygen contents of the test emulsion can be measured directly by the weakening of the electric current from minute to minute.—M. Rohrlich, F. Tödt, and G. Ziehmann, *Fette, Seifen, Anstrichmittel*, 1956, **58**, 1057.

TOMATO JUICE

Recent Production Trends

Recent developments in the Italian tomato processing industry aim at producing new dual-purpose concentrates which can be used both as a condiment and for the preparation of tomato juice drinks. The same preliminary treatment is applied to the tomato juice in both cases. This consists of removing excessive cellulose contents by means of a special centrifuge; removing excessive air contents through de-aeration under vacuum; preventing all enzymatic activity through high-temperature short-time pasteurisation. There is also a distinct trend favouring "clouded" and "pulpy" juice rather than clear juice, mainly because the former varieties have a higher organoleptic and nutritional value. The processing methods applicable to these three varieties of fruit juice differ considerably.—A. Bertuzzi, *Revue Technique de l'Industrie Alimentaire*, 1957, No. 39, 24.

FOOD HYGIENE

Disinfectants may Stimulate Bacteria

Certain disinfectants, when applied in very low concentration, are liable to have the opposite effect to that intended, inasmuch as they are able to stimulate the growth of micro-organisms. The German Federal Meat Research Institute at Kulmbach has observed the stimulation of bacteria, yeast and mould species by a number of bactericides. Investigations on certain disinfectants normally recommended for use in the meat industry showed that even with these very low concentrations of the order of 0·001 or 0·0001% stimulated the growth of certain micro-organisms.—L. Leistner, *Die Fleischwirtschaft*, 1957, **9**, 13.

SAUSAGES

Ingredient Studies

Research workers at the German Federal Meat Research Institute at Kulmbach have tried to ascertain the effect of raw materials on the composition of the sausage mix. They have established certain empiric rules for the most economic use of raw materials in sausage production. The results are presented in tables which allow the prediction of the fat contents of a sausage ready for sale which has been produced in accordance with a given formula or, alternatively, the choice of the recipe required to produce a sausage having, at the time of sale, a given fat content. The date on which a sausage with a certain dryness and fat content will have the best quality for sale can also be determined from the tables.—L. Schön and M. Stosiek, *Die Fleischwirtschaft*, 1956, **8**, 729.

FISH

Black Spot on Prawns

Black spot discolorations on prawns occur on the shell, at the abdominal joints, in the head and on the flesh under the shell, especially where the segments join. They usually develop during storage on a trawler, but become apparent at a later stage, either in retail stores or in the frozen state.

Research has shown that the formation of the melanin pigment normally depends upon the availability of a suitable substrate (usually tyrosine or hydroxyphenylalanine), molecular oxygen and the enzyme tyrosinase. If any of these three chemicals are absent, the formation of black spot is impaired. This may be done by using sulphite ice.

Prawns packed in ice containing 0·25% sodium bisulphite or sulphite were protected almost perfectly from black spot formation for 14 days. The same percentage of sodium chloride ice was not so successful as the sulphite ice.

Sulphite ice also keeps the prawns slightly colder and decreases the number of bacteria, thus increasing their storage life. The prawns retain their natural colour and the sulphite prevents odours for a longer period. However, certain sections of the prawns which come in contact with the ice are bleached. These areas become brown when the prawns are cooked and are slightly tougher than the remainder of the prawn. It is thought, however, that weaker solutions of sulphite will give good results, and that when thoroughly washed at a commercial plant the prawns will prove to be free of sulphite.

On trawlers the prawns should be thoroughly washed and iced down within 2-3 hr. of being brought aboard. Headed prawns can be kept longer than whole prawns.—D. J. Gates, *Fisheries Newsletter* (Australia), 1956, **15**, 9, 7.

PECTIN

Determination of Grade Strength

A provisional standard method for the determination of grade strength of pectins, described by a sub-committee of the British Food Manufacturing Industries Research Association, has recently been critically examined, and inconsistencies have been found. These can be overcome by suitable modifications. In the modified procedure the pectin solution is mixed with a determined quantity of *Teepol*, or other suitable surface-active agent, before being boiled with sugar and acid to produce a gel of soluble-solids content of 70·5±0·5% (by refractometer) and a *p*H of 3·10±0·05 (50% w/w solution of gel). The gel strength is measured by the Ridgelimeter.—M. Olliver, P. Wade and K. P. Dent, *Analyst*, 1957, 82 (971), 127.

VITAMIN C

Concentrates from Pine Prickles

In Poland laboratory scale studies of the production of vitamin C concentrates from pine prickles in the form of a syrup showed that one-step maceration in water at 40-45°C. gives the best concentrates. The purification of pine prickle concentrates, performed, on the basis of W. N. Bukin's studies, by means of a specially prepared activated carbon, gave good results as to flavour and as to vitamin C. The average yields of ascorbic acid in particular phases are as follows:

in extraction—58%
in purifying process—88%
in condensing process—90%
in the total process—45·9%

The highest content of ascorbic acid in the syrups reached 370 mg%. Principles are given for experimental production on a semi-technical scale of vitamin syrups from pine prickles.—Z. Pazola *et al.*, *Prace Inst. i Labor. Przem. Lek. i Spoz.* (Polish), 1955, No. 4.

Glyceryl Monostearate

(*Concluded from page* 168)

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Machinery and Equipment

AUTOMATIC LABELLER

A new fully automatic version of their *Pony Labelrite* labelling machine has been developed by G. D. Peters and Co., Ltd., The company say that this new model A.86.ML incorporates the features of their standard 86.ML model—vacuum pick-up for labels, straight-line labelling for perfect register and twin roller glue mechanism for positive glue control—but does not require an operator.

The machine labels 30 to 60 large bottles per min. or 60 to 120 small bottles (two at a time) per min. in the vertical position. Existing standard models can be converted for automatic operation.

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CONTROL APPARATUS

Process control equipment to be displayed by the Donovan Electrical Co., Ltd., at the Association of Supervising Electrical Engineers Exhibition (April 9 to 13) will include apparatus for motor control, circuit control, and machine tool and conveyor control. Among the distribution gear shown will be a range of *Dunlok Safuse and Scrutact* switch and fuse gear.

A range of direct-on-line starters up to 75 h.p. (including a new improved pattern of size 0 up to 3 h.p.) will be among the motor control apparatus on view, together with star-delta and resistance starters of various types and small power replays, latched relays and larger contactors up to 300 amps.

Donovans' are also exhibiting a sample "readily replaceable" front-connected "plug-in" control panel as used in building switchboards (to their provisional patent) for high productivity transfer machines and process plant. They will also show examples of their range of special control panels for machine tools and other applications.

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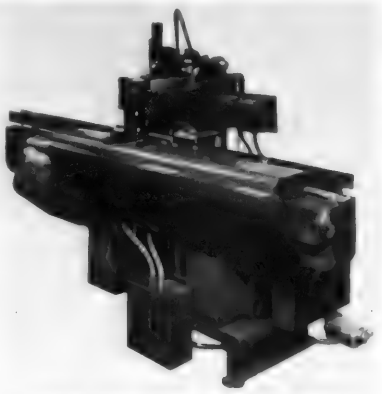
GHERKIN SLICER

The problems of a pickle manufacturer and the economical packaging of food containers are among the cases recently solved by Rhoden Partners, Ltd., design and development engineers. They designed a simple rotary slicing machine for gherkins which saves 85% of the slicing time in a mixed pickle factory. They also designed a cartoning machine with an attachment which erects and feeds the cartons automatically. Normally when jars, cans, bottles and boxes are packed into fibreboard cartons by machine, at least one operator is required to



Fully automatic labelling machine.

erect the one-piece cartons and feed them into the cartoning machine—a manual operation which is eliminated with the new device.

Rhoden Partners have for some years been designing specialised machinery—mainly for handling, assembling and packaging—which enable manufacturers to overcome individual production problems. They also carry out straightforward drafting work and tracing for engineering companies.

———

PNEUMATIC PUMP

A new air-operated pump has been produced which embodies a motor with only two moving parts, thus ensuring low cost and high efficiency. Known as the *Neumo* range, they are manufactured by the S.E.D. Engineering Co. and marketed by Kingsbourne Products, Ltd. It is stated that they have no metal-to-metal sliding contact so that they can compare with flameproof pumps. The pump can raise a system to a given pressure and then stall, only re-starting when pressure in the system drops.

The double-acting plunger type pump with disc valves allows liquids to be raised to a considerable head. Standard pumps are of cast iron with alternatives available in the plunger and glands of leather, synthetics or P.T.F.E. Pumps can be made of special materials to order and the manufacturers intend to market an inert pump entirely of P.T.F.E.

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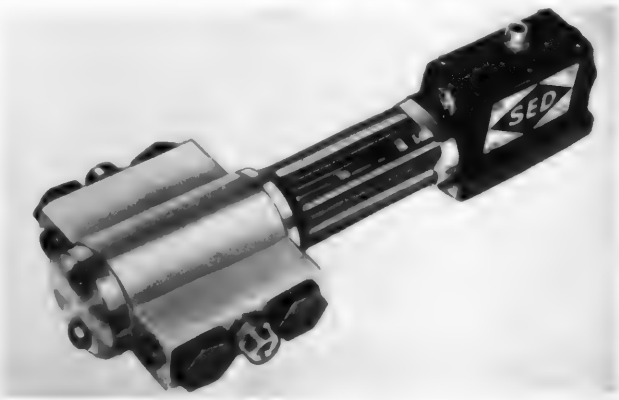
ELECTRO-MECHANICAL COUNTER

A new light-weight, high-speed electro-mechanical counter has been introduced by Counting Instruments, Ltd. Known as the type 54/4, it is a compact instrument consisting of a series of moulded number wheels and pinions giving a display from 0000 to 9999. This assembly is driven from a balanced escapement mechanism set in jewel bearings and energised by one or more electro-magnets spaced around a common armature. Armature to pole gaps are less than ·002 in. and held to close limits to ensure a highly efficient magnetic circuit.

The operational voltage is from 22-29 volts D.C. and the counter will operate on pulses of 10 milliseconds at a maximum rate of 37 per sec.

It is claimed that due to the construction of the mechanical assembly, the counter will not fail under severe mechanical shock and has been subjected to 7 G. in two directions and maintained an accurate count. It weighs only 1·1 oz. The counter can be supplied for plug-in connection or with flying leads.

Another counter, type 52/4 has been developed which is similar to the 54/4 except that it is provided with mechanical reset. This added feature however, limits the operational speed at present, to 16 counts per sec.



Pneumatically operated pump with only two moving parts.

SIX CYLINDER FREON COMPRESSOR

A new range of high speed single acting compressors is claimed to give extremely high capacity refrigerating output for the floor space occupied. The machines will be available in 4 or 6 cylinder units.

The first of the new range, made by the Lightfoot Refrigeration Co., Ltd., is the W. 225, 6 cylinder compressor. It has a maximum speed of 1,450 r.p.m., can be fitted with unloading gear for "no load" starting, and will be available with three stage capacity control if required.

The crankcase, of *en bloc* design, is fitted with removable liners and forms a reservoir for oil. A gear pump driven by the crankshaft supplies forced lubrication to all bearings and provides the necessary oil pressure for the unloading equipment or capacity control if these are fitted.

The compressor valves, which are manufactured from special alloy, are of the low lift ring plate type for durability and quiet operation and the main service stop valves, which are mounted on top of the crankcase, are provided with sealing caps to prevent refrigerant leakage.

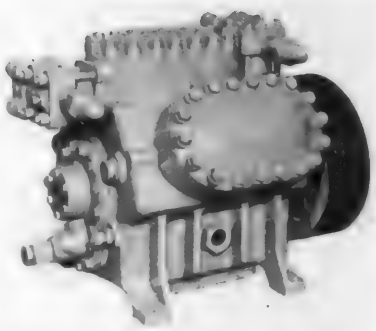
This machine is fitted with a grooved flywheel suitable for Vee-belt drive.

PARCELLING MACHINE

An automatic machine for parcelling a number of packets (*e.g.* 24 × ¼ lb. packets of tea in Kraft paper sealed with glue) has been developed by C. S. du Mont, Ltd. It is claimed that the D.M. parcelling machine will handle almost any commodity of a rectangular shape with an output of between 10 and 12 parcels per min. The sizes of the parcels handled are from 6 in. × 6 in. × 2 in. high to 15 in. × 10 in. × 7½ in. high. Although primarily designed for a one-size parcel, the machine can be supplied with height adjustment.

After packets are stacked in the loading trough, operations are fully automatic. Paper is fed from the reel, the stack travelling longitudinally through the machine, away from the operator. It is then elevated and conveyed back to the operator at a higher level. During these movements the stack is wrapped in Kraft paper and glued at five separate points, being finally discharged through compression belts. A feature of the machine is that the ends of the parcel have in effect all-over glueing of the flaps, presenting a thoroughly sealed parcel.

The D.M. parcelling machine is said to require very little maintenance other than regular cleaning and grease gun lubrication. It occupies a floor space approximately 8 ft. 6 in. × 3 ft. 2 in. and is 5 ft. high. The loading trough which can be one either side of the machine, protrudes about 18 in.



Lightfoot Refrigeration's new 6-cylinder compressor.

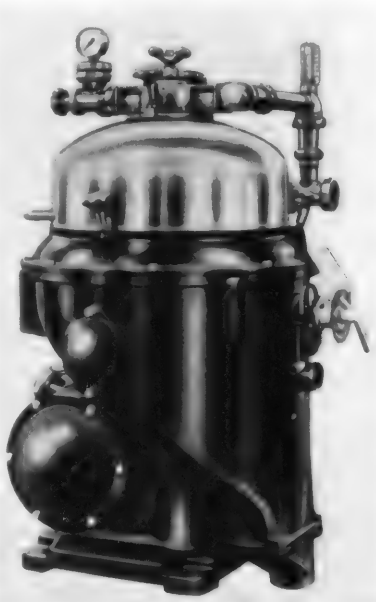
SELF-OPENING SEPARATOR

A new version of the *De Laval* self-opening separator has been introduced by the Alfa-Laval Co., Ltd. Known as the type Px 209-00s, it has a constant capacity disc type bowl for either liquid/solid or liquid/liquid/solid separation. The bowl is fitted with a special hydraulic mechanism whereby solids may be ejected while the bowl is running at full speed. Stoppages for bowl cleaning are thereby eliminated and by using this machine processes can be put on a fully automatic basis consequently saving manpower.

The bowl opening may be either controlled manually or fully automatically by means of an automatic timing device.

The liquid contact parts of the new separator are of stainless steel. The machine may be either gravity or pump fed. There is a special paring disc discharge whereby the clarified liquid is discharged in a non-aerated condition and under pressure. Consequently, the clarified liquid can be discharged to a height of 60 ft. without additional pumping.

The separator is recommended for handling such liquors as beer, beer wort, wine, molasses, fruit juice, caustic lye, animal fats, etc. It is fitted with flowmeter, sight glasses, pressure gauge, etc.



New version of the "De Laval" self-opening separator.

RECORDING EQUIPMENT

Recording and control equipment and apparatus displayed by the Cambridge Instrument Co., Ltd., at the recent Physical Society exhibition included the Cambridge-Thomas recording gas calorimeter, the Lindemann electrometer transducer, and a new coding system for sequential measurement.

The transducer is an arrangement which allows the deflection of the Lindemann electrometer to be observed and recorded by normal electronic methods. It may be used in conjunction with ionisation chambers, for *p*H determination, measurement of small currents, etc.

In the new coding system, scanned points are encoded by a method which makes use of both basic movements of a recorder: the horizontal pen movement and the vertical chart movement. The resulting code appears in the form of "blips" and the system can be applied to 99 or more individual points, *e.g.* the recording of multiple temperatures.

PRESERVED PROVISION RETORT

The Waller preserved provision retort and steriliser is recommended for the preparation and canning of jams, and is also used for preserving meat, fish, fruit and vegetables. These retorts have been in production for well over 30 years and in nearly all cases are still giving good service. Small modifications have been made from time to time, and recently the appearance has been improved, but the basic design remains unchanged.

Each retort is fitted with a steam valve, safety valve, thermometer, steam gauge and syphon blow-off cock and spanner, door spanner and two four-wheel trolleys. These trolleys run between guide rails inside the retort and bogies can be provided so that they can be wheeled into position directly in front of the door. The balanced door is supported on a galleos runway, which swings on a pivot, requiring the minimum pressure to open or close it. It can also be swung alongside the tank out of the way for charging or discharging. Internal piping can be fitted when glass containers are used, which diverts the steam from falling directly on the glass and so causing breakages.

SEMI-AUTOMATIC FILLER

A new *Flexifil* semi-automatic tube filling machine has been designed and built by Flexile Metal Company and is said to be the first of its kind.

The machine is driven by a fractional electric motor mounted in the housing, leaving the operator with both hands free to handle tubes. Running at 18 strokes per min. the machine can be expected to give an output of 40 to 50 gross per day.

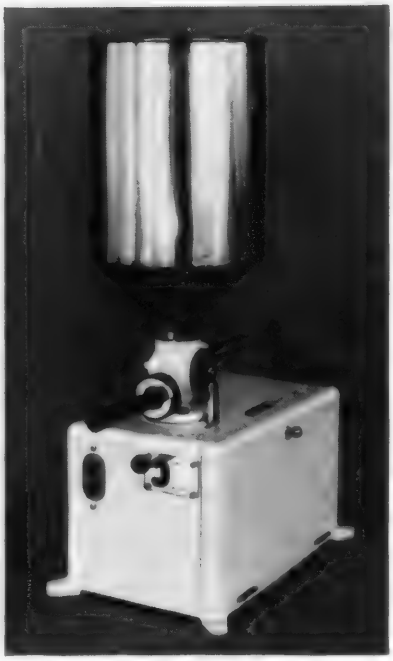
The machine is suitable for filling jars and tins as well as tubes. All parts in contact with the product are of stainless steel. The stroke of the pump and thus the volume of fill can easily be adjusted. Three alternative pumps are available giving any volume from 0·17 fl. oz. (5 c.c.) to 6 fl. oz. (170 c.c.). A simple form of semi-rotary valve with a positive action is used and the piston is fitted with rubber or Neoprene "O" rings instead of the more usual leather packing gland. The whole machine is easily stripped down for cleaning and for sterile products all parts can be sterilised in an autoclave. The machine is self-contained and merely requires plugging into an electrical outlet.

The price of the standard *Flexifil* is £125 with one pump, one nozzle and a 3½ gal. hopper. Larger hoppers, water jackets, alternative pumps and spare nozzles can be provided as extras.

SPRAY DRIED FRUIT AND VEGETABLES

Powdered fruit and vegetable products can be made in a French spray drying apparatus made by Les Appareils Ramm (British agents, Charles E. Douglas and Co., Ltd.). The powders are non-hygroscopic and can be stored indefinitely. They are intended to take the place of synthetic colouring and flavouring agents.

The fruit or vegetable in pulp, ground or concentrated form is fed into the drier through an atomiser situated in the top of the machine. Hot air enters the chamber and dries the atomised particles into a fine powder which is carried by forced draught into a smaller chamber and thence through the outlet.



Semi-automatic filler

The spray drier can be used for the manufacture of powders from tomatoes, and other fruits and vegetables. Tests have been made on citrus fruits, but because of the hygroscopicity of these products, have not been fully successful.

The same company make an evaporator for jam manufacture in which the jam is cooked at a temperature of about 60°C. The very gentle movement of the heating unit results in a jam in which the fruit is not crushed. It is claimed that even the most delicate fruits remain whole.

BAG MAKER

New packaging machines for the production of moisture-proof containers for highly hygroscopic materials and liquids, are being made by Fr. Hesser Maschinenfabrik A.G. of Stuttgart. There are various types of machines available for double paper bags and cartons with liner bags which may have an inner bag of heat-sealable material, heat sealed on all seams.

These machines have been supplied for packing milk powder, baby food, sugar and various other commodities. Some of them are working in very adverse climatic conditions, as in the Belgian Congo, where the machines give protection to the sugar which is packed there for retail consumption. The top of these double bags with heat-sealed inner bag have the rolled-in type of top closure.

Similar machines are also in use in the U.K. for packing cocoa powder, but without heat-sealed top closure to ensure that the cocoa "breathes."

Recently a new design has been developed, where the machine makes up the carton with a heat-sealed inner bag, the seams being produced on the *Finseal* method, thus ensuring maximum protection with a guarantee of absolute air tightness. This type of machine has been found of great interest to users where their materials to be packed are subject to deterioration on coming into contact with air.

It is possible to use this machine in connection with the filling of liquids, such as milk, syrup, etc.

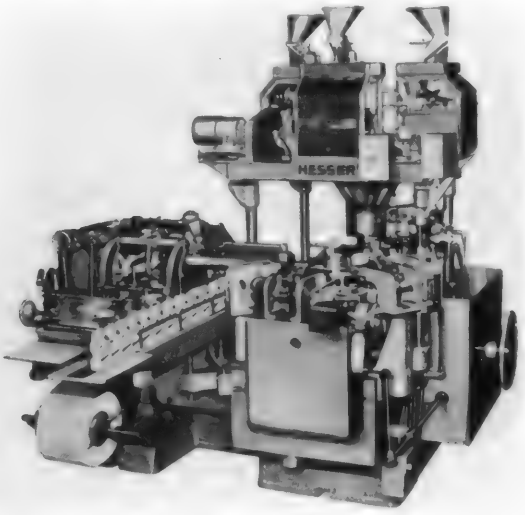
The rectangular shape of the packets produced with this method reduce storage and freight space to a minimum.

REGISTRATION CONTROL

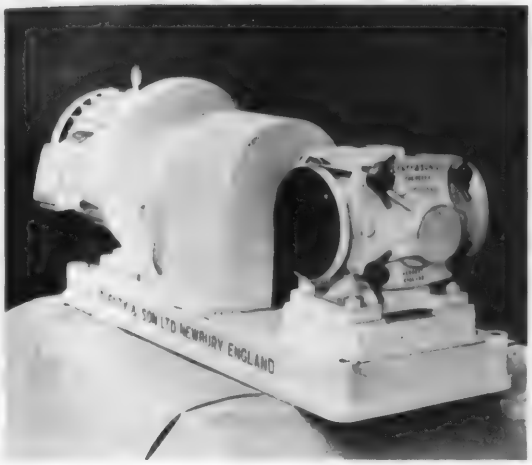
Photo-electric cross cut registration controllers have been developed by Elcontrol, Ltd., to synchronise the rotary knife or other operating mechanism on a high speed wrapping or packing machine with the printed pattern on the wrapper strip.

The basic principle used in accurate registration control is to scan the wrapper strip photo-electrically and, making use of either specially printed registration marks or part of the printed pattern, actuate the correction mechanism of the machine when the out-of-synchronism reaches a predetermined amount. This can be accomplished either by one- or two-way registration.

One-way registration requires either a registration mark or part of the printed pattern to be scanned photo-electrically and a correction mechanism to be fitted to the machine, capable of retarding the position of the knife with respect to the strip feed. The feed of the strip is arranged to underfeed by a fixed amount and when the predetermined distance of out-of-synchronism is reached the knife-retarding mechanism



Double-paper bags with a heat-sealed inner bag are made on this German machine.



This "Easiclean" rotary pump can be dismantled by one man, using one tool, in one minute, claim its manufacturers.

will be operated, bringing the set-up back into synchronisation. Cam operated switches on the machine determine for how long the correction is applied and, where a part of the printed pattern is used, ensure that only the chosen part of the pattern is used for registration purposes.

In the two-way registration method a registration mark only can be used, and the knife mechanism (or the wrapper feed) must be capable of being both advanced and retarded. When the strip is running in correct synchronisation, no correction will be applied, but when it drifts out of synchronism either way the appropriate correction will be applied for a fixed length of time. A cam operated selection switch on the machine is required to determine which way the correction is to be applied and the length of time of correction can be varied in the electronic unit.

ROTARY PUMP

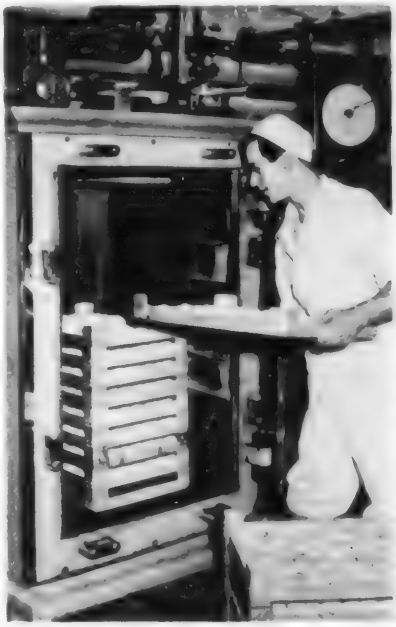
A rotary pump whose special features are ease of dismantling and cleaning, has been added by Plenty and Son, Ltd., to their range of positive displacement pumps. They claim that their *Easiclean* pump can be dismantled by one man using one tool in 1 min., and the same claim is made for assembly. The new model possesses all the features of the rest of the range —self-priming under all conditions; no churning or aeration; wide sealing surfaces and low bearing pressures giving long life and abrasion resistance; no crevices for lodgment of impurities; and interchangeability of spare parts.

Four captive thumb screws hold the end covers. When these are undone a special withdrawal tool is inserted into the pump shaft which can then be withdrawn complete with rotor and blades, leaving the outer body complete with piping, drive coupling and guard undisturbed. The body can then be hosed, steamed or washed out with solvent, while the end covers, shaft, rotor and blades can be washed, steamed or dipped. Skilled labour is unnecessary and there are no valves, washers, pins, springs, nuts, bearings or other bits to get lost or damaged.

The pumps are made with stainless steel bodies, rotors and shafts and a special chemically inert bonded material is used for the liner, bearings and blades. Other materials are available when required. The pumps can be supplied with standard flanges or with stainless dairy couplings.

Other features of the pump include an extra long plain bearing at the drive end which eliminates gland packing where very viscous materials are concerned, though gland space is provided for moulded anti-toxic sealing rings or mechanical seals. The unit is mounted on a cast-iron base-plate and the drive is *via* a geared motor unit and special flexible coupling which remains in place when the shaft is withdrawn. The keys on the shaft are tapered to facilitate reassembly. Other forms of drive or bare pumps are available.

The capacity of the *Easiclean* depends on the viscosity and other characteristics of the medium to be handled, but standard units will handle between 33 and 90 gal. per min. when running on medium viscosity. Outputs between 20 and 100 gal. per min. can be obtained, depending on operating conditions.



This cooker has been installed at the Willesden factory of T. Wall and Sons (Meat Products), Ltd., for hard-boiling eggs for Wall's 6 lb. "Grosvenor" pies. The cooker is capable of hard-boiling 15,000 eggs in 17 mins. Made by Lockhart Equipment, Ltd., of Reading, it works on steam at 210 to 212°F. At the height of the season Wall's cook more than 30,000 eggs a day.

INDUSTRIAL TRUCKS

To provide a guide for the man "who wants to improve his materials handling but is not certain of the manner of selecting the industrial truck which best fits his needs" an article has been written by two prominent members of the Yale and Towne Manufacturing Company. The types of equipment discussed are straight load carriers, tractor and trailer combinations, low and high lift platform and pallet trucks, fork lift trucks and crane trucks. The principles may be summarised as follows:

When minimum capital investment is desired, petrol powered industrial trucks are best. Electric trucks are preferable to petrol vehicles when minimum operating and maintenance costs and maximum cleanliness of product and personnel are desired and when excessive dirt, dust and abrasives are present in the atmosphere.

Tractor-trailer combinations are most economical when large quantities of material have to be transported over very long distances, and platform trucks are most economical when materials have to be transported frequently between several manufacturing operations without stacking. Platform trucks are also preferable when inadequate space, light floor loads, narrow aisles, small doorways, low headroom and small elevators are present.

Fork lift trucks are the most desirable type of equipment when materials are to be stacked in several levels of skids or pallets or when a single truck has to perform a number of functions involving a variety of materials or when single floor buildings, good flooring, wide aisles and ample headroom are present.

When a variety of bulky and awkward shapes are involved for which attachments or special handling devices are not available, a crane truck is the proper equipment.

Solid tyres are preferable to pneumatic tyres, except when fragile materials and rough pavements are present.

News Digest

Ultrasonics Plus Freezing Keeps Milk for a Year

A method of preparing frozen milk so that it can be stored for at least a year without deterioration, has been developed by the National Institute for Research in Dairying, with financial support from the National Research Development Corporation.

The milk is first pasteurised and treated with ultrasonic waves, then poured into polythene bags and quickly frozen in a brine bath. In their annual report, the N.R.D.C. say that this milk will be of value in long sea voyages, and that it will offer a means of storing milk during gluts.

The corporation, to whom the patent rights have been transferred, have licensed the process to two British firms. One of them, Sidall's Ice Cream Co., Ltd., is already in production.

45-year-old polar rations "still good"

A dozen tins of polar rations dumped by Captain R. F. Scott during his ill-fated Antarctic expedition of 1911 were ceremoniously opened and sampled by his son, Mr. Peter Scott, at the Tin Research Institute last month.

The cans, of lunch tongue, pemmican, condensed milk, jam and baked beans, were retrieved by the advance American expedition of the Geophysical Year. Although some of them were rusty, the contents of all were excellent according to Mr. Scott and representatives of the food and canning industries who assisted in the sampling. A can of Hartley's gooseberry jam aroused the greatest admiration. Lacquered externally it had also kept the freshest appearance. The jam had liquefied a little but Hartley's representative said it "tasted magnificent," commenting that it was made from Warrington gooseberries, a type now almost unobtainable.

Subsidy for herring industry

Additional financial assistance for the herring industry has been proposed by the Government. Announcing the proposals in the House of Commons recently, Mr. J. S. Maclay, Secretary for Scotland, said that in the last two years the herring fleet and catch had each fallen by about 30%, partly because of the attraction of vessels to the white fish industry.

The proposals are that herring fishermen should receive a direct subsidy broadly similar to the white fish subsidy.

CO_2 slaughtering proposed

Local authority associations have been asked by the Ministry of Agriculture and Food for their views on representations made by bacon producers and a number of other interests that the carbon dioxide method of anæsthetising pigs for slaughter (as used in some foreign bacon factories) should be permitted. The Minister has told the associations that he has been advised that the new method is humane and has no ill-effect on the meat produced.

He proposes to introduce amending legislation to permit, by regulation, the use of any new method of anæsthetising animals at slaughter houses, after consultation with organisations representative of the interests concerned.

The Standing Joint Committee of the 29 London borough councils says it has told the Ministry that, on the assumption that the anæsthetising of pigs is humane and that the meat produced after slaughter has not been affected in any way, it has no objection to the proposal.

An article describing the anæsthetising of pigs by CO_2 will shortly appear in FOOD MANUFACTURE.

Public Analysts Regulations

The Public Analysts Regulations, 1957, have been published by the Minister of Agriculture, Fisheries and Food and will come into operation on May 27. The regulations have been published as a Statutory Instrument (1957, No. 273).

The regulations, which revoke the Public Analysts Regulations (S.R. and O., 1939, No. 840), make no significant change in the qualifications required by a public analyst. A revised form of certificate is prescribed, which takes account of the section of the Food and Drugs Act, 1955, which provides that if the public analyst, to whom a sample was originally submitted, is unable to undertake the analysis he may send to the public analyst for some other area; and of the section which permits an analysis to be undertaken under the direction of the analyst who signs the certificate.

News For Importers

Shelled almonds. The Treasury have made the Import Duties (Drawback) (No. 2) Order, 1957, which increases, from 54s. to 66s. per cwt., the rate of drawback of Customs duty allowable on unblanched shelled almonds used in the manufacture of certain descriptions of exported blanched almonds. The Order came into operation on March 1, and has been published as S.I. 1957, No. 282.

Dried fruits. The Board of Trade have made arrangements for the further import of various types of dried fruits from the U.S.A., to be purchased with dollars made available under the United States Mutual Security Act, 1954 (Public Law 665). The fruits will not be eligible for any U.S. export subsidy.

The fruits are as follows:

(*a*) seedless (as distinct from deseeded) raisins of any type;
(*b*) prunes; and
(*c*) dried pears, apricots, dates and figs, and mixtures of dried tree fruits containing not less than 60% by weight of prunes, pears and apricots.

Licences will be valid until June 30, 1957. Details are given in Notice to Importers No. 810 dated February 7, issued by the Import Licensing Branch of the Board of Trade.

Sugar. The arrangements for importing sugar from countries or territories which are not parties to the International Sugar Agreement are described in Para. 5 of Notice to Importers No. 806 (dated December 12, 1956). It has already been announced by the Ministry of Agriculture, Fisheries and Food that, consequent upon a notification made to the International Sugar Council, it is not necessary for the time being to restrict imports of sugar from countries which do not participate in the International Sugar Agreement.

The Board of Trade now announce that the arrangements described in paras. 5 and 6 of Notice to Importers No. 806 are accordingly suspended until further notice. Instead, specific licences will be issued freely for imports of sugar (including invert sugars, molasses, syrup and other forms of liquid sugar not admissible under Open General Licence) originating in countries or territories which are not parties to the International Sugar Agreement.

Applications for specific licences should be made on Form ILB/A to the Import Licensing Branch, Board of Trade, 43, Marsham Street, London,

This 130lb. cake showing the Duke of Edinburgh's route across Australia was shown at the Australian stand at the Ideal Home Exhibition. It was made with Australian dried fruits and iced in colours to distinguish the States.

S.W.1. Full details are contained in Notice to Importers, No. 811, available from the Import Licensing Branch.

Licences will be valid for three months from the date of issue.

New potatoes and raw vegetables. The Minister of Agriculture, Fisheries and Food has made an Order called the Importation of New Potatoes and Raw Vegetables (England and Wales) Order, 1957, which came in to force on March 1.

The new Order, which provides for relaxations similar to those made last year to the requirements of the Importation of Plants Order, 1955, allows the importation into England and Wales during certain periods in 1957 of specified raw vegetables from Belgium, France and the Netherlands and of new potatoes from France, Portugal and Spain, subject to modified safeguards against the introduction of Colorado beetle.

Copies of the Order (S.I., 1957, No. 298) may be obtained from H.M. Stationery Office (price 3d.).

Canning talks for grocers

A series of afternoon programmes to give retail grocers guidance in the handling of canned foods has been arranged by the Canned Foods Advisory Bureau. The audience at the first afternoon session were given an account of the history of canned foods, a description of modern can manufacturing methods by Mr. J. W. Thorne, the manager of the Metal Box service depot at Worcester, and were shown a colour film by Smedleys showing how fresh produce is harvested and canned.

Food for the Ideal Home

Food, as usual, provided a big attraction at the *Daily Mail* Ideal Home Exhibition at Olympia last month.

Peek, Frean and Co., Ltd., whose centenary year this is, featured an enamelled Centenary tin containing an assortment of cream biscuits, among their five Exhibition packs. (*See p.* 188.)

A new product, *Toyland* marmalade, was featured by Chivers and Sons, Ltd. It has no peel, but the goodness and flavour of this part of the orange are not lost, the peel having been finely ground and mixed in.

Theme of the United Dairies, Ltd.'s display was "Your Link with the Farm" and they demonstrated with samples, evaporated milk, canned rice pudding and other products made by their subsidiary, Wilts. United Dairies. The stand represented a farm scene.

The Hovis bakery again attracted visitors, who watched the whole process of baking, from the mixing of the flour to the popping of the tins into the oven. Visitors were also able to buy miniature brown loaves fresh from the oven.

Cadbury Brothers, Ltd., displayed an enrober machine covering biscuits with dairy milk chocolate. A special Exhibition pack containing a selection of Cadbury's milk chocolate-covered biscuits was on sale, together with a complete range of ¼ lb. packets of chocolate biscuits.

G. and T. Bridgewater, Ltd., showed their speciality biscuits, *Dad's Cookies*, and Bridgewater wafers.

Palmer Mann and Co.'s *Sifta Sam's* stand had a circus background, with three clowns balancing replicas of Sifta Sam's salt—Sifta and A 1.

JIF plastic lemons were exhibited by J. and J. Colman, a branch of Reckitt and Colman, Ltd. The lemons are squeezed in Sicily and vacuum packed into plastic containers at the firm's works near Norwich.

Whiteways Cyder Co., Ltd., showed and sold *Cydrax*, their non-alcoholic drink. Also displayed were Devonshire cyders, British wines, *Baby Pom* (perry) and cyder vinegar.

Batchelors Peas, Ltd., showed a comprehensive range of their foods, and visitors were able to taste many of their soups, including a new celery soup, and tomato. Small-size cans were also on sale.

Guy Leonard and Co., Ltd., divided their stand into two parts, one displaying *Sasso* olive oil, and the second a varied selection of Continental foods.

The Stork Margarine Cookery Service offered cookery advice and samples.

Smith's Potato Crisps, Ltd., displayed a new "Family Pack" and their pre-war line—nuts and raisins.

Samples of *Ye Olde Oak* luncheon meat were given away by Rowland Smith and Son.

Items displayed by J. A. Sharwood and Co., Ltd., included Indian condiments, particularly chutney and curry powder. Rayner and Co., Ltd., also showed chutney and various flavouring essences and food colourings.

Visitors to E. Shaw and Sons were able to see the workings of a beehive and could purchase honey in the comb and extracted honey, both set and clear.

Henry Denny and Sons, Ltd., showed and sold skinless pork sausages and pre-packaged sliced rindless bacon.

A wine-tasting bar, a celebrities' corner and a fruit-juice counter were features of the Australian national stand, staffed by attractive Australian gifts. Iced tomato juice and pineapple juice was dispensed to visitors at top speed.

Other exhibitors included, Marmite, Ltd.; L. E. Pritchett and Co., Ltd.; Farquhar North and Co., Ltd.; S. J. Palmer (Newcastle), Ltd.; Kavli, Ltd.; Anglo-Swiss Food Products, Ltd.; Baxter and Son, Ltd.; The Cirio Co., Ltd.; and Jules Duval and Co., Ltd., who made "Wines within the reach of the most modest purse" a feature of their display.

Cadbury's "at home" to their customers

Cadburys will again be "at home" to ten thousand of their customers, this time from the North-West, who are to be invited to make a day trip to Bournville this year.

In a series of trade visits, which began in March and will end next October, parties of about 400 shopkeepers—accompanied by their wives, if they wish—will be the guests of Cadbury Brothers, Ltd.

People

Dr. Franklin Kidd

DR. FRANKLIN KIDD, C.B.E., F.R.S., has relinquished his post as Director of Food Investigation after nearly 40 years' service with the D.S.I.R.'s Food Investigation Organisation. No successor has yet been appointed. For the time being the functions of the Director of Food Investigation will be discharged by the secretary of the department.

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SIR GERALD BARRY has told the National Farmers Union that he must reluctantly discontinue his services as the Union's adviser on public policy because of the claims of his other interests. His resignation will take effect from April 30.

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Three depot managers have been made divisional sales managers by the Eldorado Ice Cream Co., Ltd. They are MR. D. W. SINCLAIR, who will be responsible for Scotland; MR. G. A. HILL-SMITH, for the south-eastern division; and MR. G. GRIMMET for the East Anglian area.

▪

MR. S. G. BROWN has joined the board of Plenty and Son, Ltd.

Mr. Brown has been employed by the company since 1929, and has always been associated with their patent positive displacement rotary pump. In his new capacity he will continue to be responsible for the pump department.

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MR. ARTHUR F. HANNELL has been appointed planned maintenance engineer at the Acton, West London, factory of T. Wall and Sons (Ice Cream), Ltd.

MR. JAMES RIGG has been appointed assistant to the refrigeration engineer, and MR. ANDREW J. STRAIN has been appointed production study section leader.

MR. T. YEO SHERWELL and GENERAL SIR WILLIAM PLATT are retiring from the Board of Mather and Platt on March 31.

▪

MR. K. D. BROUGH, MR. D. B. HUFFAM, MR. A. W. PAGE and MR. C. E. SUTTON have been appointed additional directors of the Metal Box Company.

▪

MR. H. D. CUMMINS and MR. D. O. HALLETT have been appointed sales director and technical director respectively of a new company, Stainless Steel Plant, Ltd. They formerly represented T. Guisti and Son, Ltd., London.

▪

MR. W. R. BRAMWELL ST. JOHN GATES has relinquished the chairmanship of Cow and Gate as he is to undergo a major operation shortly.

MR. ERNEST E. TAYLOR has unanimously been elected the new chairman.

•

MR. W. C. PATERSON has been appointed S.W. area sales manager by Smedley's, Ltd. Mr. Paterson gained his experience in the food industry with two nationally known companies before joining Smedley's in March, 1956, as a sales representative.

▪

MR. A. E. WALKER, formerly a senior field executive of Crosse and Blackwell, Ltd., has been appointed zone manager for the whole of Scotland. His headquarters will be the newly opened sales office at the company's premises, High Street Goods Station (B.R.), Glasgow.

▪

MR. VICTOR THOMAS, who for the past 12 months has been general sales manager in charge of all home sales of Fielden Electronics, Ltd., has now also accepted responsibility for export activity.

Mr. Thomas (36) has had 10 years experience of selling in the electronic instruments field. Before joining Fieldens Mr. Thomas was employed with Electronic Instruments, Ltd., first as a representative and later as assistant sales manager. He was appointed sales promotion manager of Fielden Electronics, Ltd. 18 months ago, and, 12 months ago was promoted to general sales manager. Although the company's instruments are based on simple principles, after-sales service is still to be of primary importance. In the last year, Mr. Thomas has, therefore, established service branches within easy reach of all the main industrial centres of this country On initiating an export division of the company he is confident that his well-proven sales ability will stand him in good stead in competitive markets abroad.

Three departmental managers have been promoted to the post of shift superintendent at Batchelors' Sheffield factory. They are MR. J. C. DELAMORE, MR. C. R. COOPER and MR. W. CHURCHILL.

MR. J. McLEAN has been appointed the new head of the production study department covering the Sheffield, Worksop and East Bridgford factories of Batchelors.

▪

MR. R. WATKINS has been appointed to represent the Cambridge Instrument Company, Ltd., at 7, Norfolk Court, Norfolk Street, Glasgow (Telephone: South 0349), and will handle all enquiries and consultations regarding new instruments. MR. S. J. STEEL will continue to handle all matters relating to repairs and service.

▪

MR. J. F. B. O'SHEA has resigned from his position as general organiser of the British Food Fair. He will continue to act as organiser until arrangements for a new appointment have been completed. The chairman of the exhibition committee of the Food Manufacturers' Federation, Mr. Frederick Monkhouse, said that the Federation would like to record its great appreciation of the outstanding work of Mr. O'Shea in organising three British Food Fairs.

•

COL. W. H. WHITBREAD, chairman of Whitbread's, is joining the board of Stroud Brewery. Whitbread's recently acquired a "substantial" interest in the equity of Stroud Brewery. The companies have had trading associations for some time and a trading agreement has now been entered into which "it is confidently anticipated will prove beneficial to both." Stroud Brewery states that the announcement does not imply any change in the present management.

▪

MR. JOHN A. FABER will be leaving Schimmel-Boehm, Ltd., to join the executive of the parent company, Schimmel and Co. Inc., of New York, at the end of June. At present he is making a tour of the firm's Scandinavian customers.

Mr. Faber has been a director of Schimmel-Boehm since its formation in 1954; his visit to Mr. Keller in New York in 1953 accelerated the negotiations which led to the formation of Schimmel - Boehm, Ltd. Having worked for some years with the Glidden Co. in Cleveland, Ohio, he is no stranger to America. Mr. Faber will remain a director of the London company and will continue to take an active interest in its affairs.

MR. JACK PAINES will take over the

sales activities formerly handled by Mr. Faber and the company will continue to be headed by Mr. J. A. Clark.

*

MR. RONALD MCKINNON WOOD, O.B.E., has relinquished his duties as chairman of Griffin and George, Ltd., in view of the duties he will assume in the near future as chairman of London County Council. MR. H. R. BETTINSON, M.C., hitherto vice-chairman, will, for the time being, act as chairman of the board.

MR. NORMAN MCKINNON WOOD has been appointed vice-chairman and relinquishes his appointment as managing director. MR. NORMAN TREPTE has been appointed managing director.

*

MR. C. G. C. THOMAS has been appointed sales manager of Salisbury Precision Engineering, Ltd., for the sale of *Sherpa* trucks and *Revelation* optical projectors. Mr. C. Chester-Browne continues as sales manager of Heston Equipment Co., Ltd., the parent company. Mr. Thomas was formerly head of the Packaging Advisory Division of Gerrard Industries, Ltd. He is also a member of the Incorporated Sales Managers Association, Institute of Materials Handling and Institute of Packaging.

*

MR. PHILIP LEA has been elected chairman of the Oat Millers' Research Committee for the current year. Mr. Lea is a director of Morning Foods, Ltd., Walter Brown and Son, Ltd., Minsal, Ltd., Lea Brothers and Blakeman (E.A.), Ltd., and Nairobi, and Wheelock Estates, Ltd. For the past 10 years he has been the official machinery adviser and consultant to the National Association of Corn and Agricultural Merchants.

Mr. Philip Lea

OBITER DICTA

● British industry is run upon tea.—*Mrs. Barbara Castle, M.P.*

● I can't eat a big meal before emoting—so I have a boiled egg. —*Actress Flora Robson.*

● Somebody on Mr. Wilfred Waterman's Dorset poultry farm is laying banana-shaped eggs.—*Daily Mail.*

● You've no idea what pleasure it gives me to drink a pint of beer instead of all that champagne.—*Lord Mayor of London.*

● Mr. Perkins saw fit to underline his objections to the board's policy with three eggs and a tomato.—*Secretary of S. Flavel and Co., describing incident at shareholders' meeting.*

● There is nothing more conducive to an expanding waistline than sweets. If the decrees of fashion are to be obeyed, then that seductive box of chocolates must be looked upon as something akin to poison.—*Medical correspondent in The Times.*

● The day is probably not far off when every dog will announce its dinner hour by dropping a tin opener in its master's lap and a cat will look at a can in the same way that its ancestors looked at kings.—*Manchester Guardian.*

● The conception of grocers entertaining their customers at their own expense and even going so far as to take them on coach trips to London or to see a West End show will hearten many who remember a long period of queues and rationing. — *Canned Foods Advisory Bureau.*

● I mingle with you in tubes and buses and in the streets, and I have the lonely feeling that I am the only one about who is resigned to the fact that if the supply of potatoes is reduced, the consumption of potatoes will *ipso facto* be reduced.—*George Schwartz in Sunday Times.*

● At the Semiramis Hotel in Cairo, a black Nubian servant brings you your breakfast tray on which your croissant and brioches are so golden and glistening that they look like plaster models—and that is the way they taste, since Egyptian bakers have learned to make the outside but not the inside of European-style bread.—*New Yorker.*

Analysts elect officers

The following have been elected officers of the Biological Methods Group of the Society for Analytical Chemistry for the forthcoming year:

Chairman: Dr. S. K. Kon; *Vice-Chairman:* Dr. J. I. M. Jones; *Hon. Secretary and Treasurer:* Mr. K. L. Smith.

———

British Soya's 25th anniversary

British Soya Products, Ltd., celebrated its 25th anniversary recently. The directors and members of the staff attended a theatre and afterwards a dinner and dance was held at the Russell Hotel, London, W.C.1.

———

Paterson Hughes' anniversary

Paterson Hughes Engineering Co., Ltd., who are celebrating their 35th anniversary this year, held their annual dinner-dance for the staff and works at Glasgow and London. At these functions all those employees with over 25 years' service were presented with a gold watch. The employee with the longest service is Mr. George Hunter, the Glasgow works fitting shop foreman, who claims equal length of service to that of the chairman.

———

New Zealanders' mission to London

Representatives of four farm producer organisations will accompany a mission to London soon to discuss trade prospects for New Zealand exports to the U.K. The seven representatives chosen have been selected from the Meat Producers' Board, the Dairy Board, the Apple and Pear Board and the Federated Farmers. Among other topics they will investigate the situation brought about by a decline in the export price of some N.Z. primary products, notably butter.

———

Chocolate workers' profitable ideas

Cadbury Brothers, Ltd., have awarded a record £912 in prize money to 272 of their employees for "bright suggestions" for improving efficiency, submitted over the past year.

The largest single prize was won by Mr. Charles Bastock of their flavouring department. He won £300 for an improved method of moulding blocks of flavouring material, used in the manufacture of certain Cadbury lines.

Other prizes included a £130 award to Mr. George Birch for an idea involving the saving of sugar tailings in the manufacture of cream centres, and £60 to Mr. M. Wetherell for an improvement in a manufacturing process to save cocoa butter.

COMPANY PROFITS AND PROSPECTS

Spratt's profits down

Spratt's Patent, Ltd., animal and poultry, etc. food manufacturers, announced a group net profit of £181,226 (£199,320) for the year ended September 30, 1956. The dividend has been raised from 12½% to 15%.

■

Rain checks Tizer profits

Tizer, Ltd., the first important soft drinks concern to publish its 1956 accounts, reports a consolidated net profit of £68,818 as against £129,777 in the exceptionally fine year of 1955. The dividend is held at 20% to which it was increased last year.

Bad weather in the peak summer months of 1956 when total soft drinks output fell by as much as 30% is responsible for the lower profits, but, bearing in mind the growing consumption of soft drinks, the long-term outlook appears favourable.

■

Profitable packaging products

Net profit for the Payne Organisation last year was £111,492 compared with £64,046 in the preceding year, announced Mr. J. E. Payne, chairman of P. P. Payne and Sons, Ltd., at the company's annual meeting. The Ordinary dividend has been maintained at 15% which, with the interim dividend makes a total of 20%.

To broaden the company's range of packaging products and to reduce selling costs, arrangements have been made with the Minnesota Mining and Manufacturing Co. to distribute *Scotch Boy* pressure sensitive tapes, and an up-to-date printing plant for these tapes is being installed.

■

Rank's interests widen

The bakery interests acquired by the Rank Organisation (see FOOD MANUFACTURE, March 1956, p. 122) have made "a satisfactory contribution" to the organisation's group profits of £5,940,071 (£5,491,603), announced the chairman, Mr. J. Arthur Rank at the annual meeting. Negotiations are in hand for the acquisition of further bakeries.

Financial results from flour milling, the group's main interest, have been very good, though in many ways the year has been difficult. Mr. Rank welcomed the withdrawal of the flour subsidy and the Government's decision not to enter the International Wheat Agreement.

An important side of the group's activities is the manufacture of *Blue Cross* animal foods. Every year the manufacture of these products becomes more technical and scientific, said Mr. Rank. Demand for the goods made at the company's new compound mill, opened during the year at Southampton, has already exceeded production. A new compound and provender mill is to be opened shortly at Gateshead.

■

Macaroni merger

A merger of macaroni interests was announced by Mr. H. M. Beak, the chairman of Foster Clark, Ltd., at the company's annual meeting recently. Negotiations which began last year for the merger with other macaroni manufacturers of the paste goods plant belonging to the company's subsidiary Alimentary Paste (Great Britain), Ltd., have now been completed and A.P.'s premises and plant at Oldham have been sold to a new company formed to manufacture the complete range of paste goods of all parties concerned. The home sales and export departments of the company continue to market AP products.

Reporting on the year, the chairman said that the company had again increased its turnover and although there was a decline in the sale of some packet goods, packet soup sales improved. The sales of *Eiffel Tower* drinks were greater than in the previous year, in spite of the disappointing summer.

Total profits of the group amounted to £61,176, compared with £32,291 last year. Net profits nearly doubled at £34,095 (£17,444) and the 5% dividend was repeated.

■

Sugar, politics and profits

Froghoppers, Russians and the recent sharp movements in sugar prices generally are reflected in the latest accounts of sugar manufacturers. Mr. E. Cassleton Elliott, chairman of **Trinidad Sugar Estates, Ltd.**, reported a disappointing year at the company's annual general meeting as due to weather conditions and froghopper damage, the crop was lower by 1,205 tons compared with 1955. However, the company's financial position remains satisfactory, the surplus of current assets over current liabilities being £173,500 compared with £168,904 last year. A 6% dividend was paid.

The West Indies Sugar Co., Ltd., also reported a lower output at 139,674 (151,953) tons, though the trading profit rose by £133,448 to £833,662. This 18% increase, said the chairman, Mr. Peter Runge, was due mainly to the sale of 20,000 tons of sugar left over from the 1955 crop and from increased rum production.

Commenting on the "Negotiated Price" for raw sugar, Mr. Runge pointed out that, after freights have been added, it does not fall far short of the cost of producing raw sugar in England from beetroots. He assured consumers that profits are being ploughed back to improve agricultural efficiency and productivity. The dividend was 6%.

Mr. Runge supported the renewal of the International Sugar Agreement because the principle of expanding Commonwealth production has been recognised. "Without the acceptance of this principle," he said, "I doubt whether the U.K. Government would be justified in supporting the Agreement, particularly because other signatory countries, notably Cuba, have the right under U.S. legislation to share (at special prices and outside the Agreement) in the growth of consumption in the U.S. from whose markets Empire producers are completely excluded."

On the day before Mr. Runge's statement was published, prices of raw and refined sugar rose in London because of reports of Russian buying of 200,000 tons of Cuban raw sugar. The purchase was not confirmed at the time but it was known that a purchase of this size would use up the rest of the Cuban Sugar Institute's reserve for the current year.

Manbré and Garton, Ltd., refiners and manufacturers of sugar and starch products, announced record group trading profits of £1,499,218 against £1,460,253 previously. Productive capacity for both sugar and glucose have steadily improved and the chairman, Mr. A. E. Berry, spoke of the increased industrial demand for sugar, particularly in the manufacture of plastics and detergents (see FOOD MANUFACTURE, February, p. 47). Net profits rose from £541,000 to £573,000 and the dividend was at 30%.

■

Confectionery profits up and down

Confectioners' profits were generally higher in 1956, to judge from recent chairman's statements. **James Pascall's** profit rose from £364,831 to £484,439 and the dividend was also increased to 55% (50%). **Jamesons Chocolates, Ltd.**, also raised their profit and dividend. The consolidated net profit was £132,325 (£88,449) and the final dividend was increased by 2½% to make a total of 15%. **J. A. and P. Holland, Ltd.**, toffee and caramel manufacturers, increased their net profit from £25,871 to £26,205. Their final dividend was 7½%, the total remaining at 12½%. The board considers that the company's objects should be widened so that, if necessary, it would be able to achieve more control over the manufacture and supply of raw materials and of the ancillary services required in the manufacture and sale of toffee. The strongest recovery was shown by **H. J. Packer and Co., Ltd.**, who reported a group profit of £124,686 in 1956 against a previous loss of £30,955. The dividend is 7½% against 10%. In 1954 the dividend was 20%.

Lower profits were announced by **Waller and Hartley, Ltd., Barratt and**

Co., Ltd., and Squirrel Confectionery, Ltd. Waller and Hartley's group net profit was £143,685 (£160,570) and their dividend remained the same at 25%. Barratt's net profit fell from £211,203 to £158,712 and the distribution at 22½% remains the same. The South African manufacturing unit in which the company is interested is being closed down. Squirrel Confectionery reported a net profit of £40,520 (£77,414) and an Ordinary dividend of 22½% (30%).

Port wine jelly

A new jelly product flavoured with port wine, has been introduced by Yeatman and Co., Ltd. It can be sold without restriction as regards Excise licensing.

Known as *Jiffi-Jelli*, the product is packed ready to serve in vacuum-sealed glass jars. The ingredients are sugar, port wine, glucose, gelatine, citric acid and colour.

Salt-free meat products

Salt-free meat products are being produced by Anton Hunink of Deventer, Netherlands. They include canned smoked meat, forcemeat balls, roast minced meat and various types of sausages. Hunink claim that although the foods contain no common salt and are therefore suitable for persons on a diet, the keeping qualities, colour, flavour and palatabilty are not affected.

A patent has been granted in Holland and applied for in other countries for this new sodium-free process.

Dairy technologists' meeting

The Spring meeting of the Society of Dairy Technology this year will be held in Blackpool from Sunday, April 28, to Friday, May 3. The main party will be accommodated at the Imperial Hotel, where all paper-reading sessions and other functions will be held.

Papers will be read on dairy farming and the dairy industry in North-West England and on further education in dairying, during the first day. On May 1 papers will be read on "Cheese packaging and marketing" (Mr. D. Petty, director, Dairy Produce Packers, Ltd.), "The production of rindless cheese" (Dr. W. G. Wearmouth, National Institute for Research in Dairying) and on "Mechanisation in the manufacture of cheese" (Mr. N. P. Stoate, managing director, Dairy Supply Co., Ltd.). The final paper on May 3 will be on "Sales development" (Mr. N. J. Kingston, Milk Marketing Board).

Excursions and visits will take place to Libby, McNeil and Libby's factory, to Dobsons Dairies' Cheshire cheese factory, to Wensleydale Creameries' cheese factory, to Hansons Dairy, Ltd., and the Liverpool Co-operative Society Dairy and to neighbouring farms and agricultural institutes.

Full details may be obtained from the Secretary, Society of Dairy Technology, 17, Devonshire Street, London, W.1.

Testing materials at Venesta's new foil laboratory. The assistants here are using the Karl Fischer apparatus (*right*) and the Ferranti viscometer (*centre background*).

Formosan pineapple

Tai Yu brand Formosan pineapple is now being shipped into this country by S. Daniels and Co. Ltd.

From the manufacturers' point of view chief interest lies in the fact that an A10 pack of 104 oz. is produced in eight different types of cut, namely, cubes of 15 mm. size, cocktail cubes of 10 mm. size, whole slices, spiral slices, half slices, quarter slices, tidbits ($\frac{1}{12}$ of a slice) and pieces ($\frac{1}{16}$ of a slice).

The *Tai Yu* group of factories have their own plantations where pineapple grown from Hawaiian seed is produced the whole year round. The plant is claimed to be modern and operated by the most up-to-date machinery in conditions of hygiene and proper sterilisation.

Changes of address

The head office address of the Metal Box Co., Ltd., is now 37, Baker Street, London, W.1. (Telephone: Hunter 5577; Telex No. 2-3651; Telegrams: Metaboxes, London, Telex.)

The offices of the British Food Fair are now at 10, Mount Row, London, W.1. (Telephone: Legation 2933.)

The head office of the Institution of Incorporated Plant Engineers has moved to 12, The Parade, Solihull, Warwicks. (Telephone: Solihull 1111; Telegrams: Planteng, Solihull.)

Aluminium foil research

A new laboratory wing has been opened by Venesta, Ltd., at their Silvertown factory to provide better facilities for quality control and research in the manufacture of their aluminium and tin foil products for food packaging. Costing about £40,000 the new extensions cover 1,635 sq. ft. bringing the total laboratory area up to 4,335 sq. ft. The laboratories contain equipment for testing foil for strength, heat-sealing qualities, grain structure, perforation and performance under tropical conditions.

In all there are five new laboratories: Colour trials laboratory, General laboratory, Coatings laboratory, Balance and instrument room, and Chemists' office.

They are so constructed that the internal partitioning walls can be removed to change the size and shape of the laboratories. This is important, for experience shows that structural alterations are occasionally necessary to cope with special forms of research or unusual experiments.

Under Dr. T. H. Angel, PH.D., A.R.I.C., there are now 9 qualified chemists and 11 assistants employed at the laboratories.

Besides the main laboratories, an inspection laboratory is maintained in the foil-rolling factory itself. The purpose of this laboratory is specifically to ensure that every individual reel of foil is produced to a consistently high standard. Thus a sample from every spool of coated foil produced by Venesta goes immediately to the inspection laboratory and is subjected to various tests, laid out under the manual number or specification for the particular customer.

Management conference

A conference for top managers in the North of England was held at Southport last month, organised by the British Institute of Management and the Institute of Industrial Administration.

Among the speakers were Mr. T. M. Higham, chief industrial psychologist of Rowntree and Co., Ltd., who spoke on "Selecting the right man for the job—a review of modern procedures," and Mr. J. C. W. Stead, production director of Batchelors Peas, Ltd., who spoke on "Developing managers for speedy and effective decision-taking."

Canner's refresher courses

Smedley's Ltd., have arranged one-week refresher courses at Wisbech for the management and technical staffs of their nine English and Scottish factories.

The syllabus includes 26 lectures on every practical aspect of canning and quick freezing from buying and contracting for raw materials; preparation and maintenance of machinery; general administration; freezing and refrigeration principles and practice and boiler-house management to quality control; work study; welfare; accident prevention and storekeeping.

The lecturers are drawn from senior members of Smedley's staff and supplemented by speakers from the National Industrial Fuel Efficiency Service, H.M. Factory Inspectorate, the Wisbech and District Water Board, the Pea Growing Research Station and F. Perkins, Ltd., of Peterborough.

Each course will include a visit to the Wisbech factory of the Metal Box Co., Ltd., and will end with an official dinner.

R.S.H. annual congress

Antibiotics, radiation preservation and other new methods in food preservation are to be discussed when medical officers of health, scientific officers of the D.S.I.R., doctors and health experts from all branches of industry and local government meet at Folkestone on April 30 for the four-day annual health congress of the Royal Society of Health.

The progress of food hygiene is the subject of a talk by Mr. L. H. Vale, chief public health inspector of Folkestone, and under the veterinary hygiene section delegates are to hear about the production and handling of meat in Australia and New Zealand and the fish industry in Gt. Britain.

World nutrition is to be discussed by Dr. Cicely E. Williams, senior lecturer in nutrition at the London School of Hygiene and Tropical Medicine, and under the preventive medicine section experts are to present papers on the fluoridation of public water supplies.

The 2,500 delegates and others are also to pay visits to food manufacturing premises, food preserving factories, breweries, bakeries and other places of interest.

Apple storage research

The storage behaviour of differently grown samples of Cox's orange pippin was under discussion at East Malling Research Station recently. Over 300 members of the Station's association gathered in the packing shed to examine some 170 trays of apples taken from scrubbed gas storage during the preceding week. Later Dr. H. B. S. Montgomery, in charge of the experiment, described how the apples were collected and put into cold storage at 37°F., and into gas storage at 38-39°F., with 5% carbon dioxide and 2½-3½% oxygen, and reviewed the results. In summing up, he suggested that the best keeping apples were small to medium in size and came from moderate crops, grown on trees in grass sward with judicious manuring. Very light soils were unsuitable. Sprays of captan had led to some reduction in the losses.

During the discussion that followed, Dr. Tomkins, superintendent of the Ditton Laboratory, told growers that no suitable fungicidal vapour had been found to control rotting in storage, but that any chemical that appeared promising would be tested. The growers agreed to support the running of the experiment again in the coming season.

Erections and Extensions

▶**Cadbury Brothers, Ltd.,** of Bournville, are constructing a storage depot at Hills Road, Cambridge.

▶The **Scottish Milk Marketing Board** has had plans prepared for the erection of a creamery at Glenrothes.

▶**Buchan's (Andrew) Breweries, Ltd.,** are planning extensions to their Crosswell Brewery, Cardiff.

▶**Foots, Ltd.,** box makers, Foots Buildings, North Shields, are planning an extension to their factory at Preston Village, Tynemouth.

▶**South-East Lancashire Pork and Bacon Co., Ltd.,** have had plans approved for the construction of a bacon curing and cold room building at Conduit Street, Ashton-under-Lyne.

▶**Kellogg Co. of Great Britain, Ltd.,** have had plans approved to build extensions to their administration offices in Park Road, Stretford.

▶**Tizer, Ltd.,** table water manufacturers, Lancs, are having an extension built to their factory at Benfield Road, Newcastle-on-Tyne, 8.

▶**Louis C. Edwards and Sons (Manchester), Ltd.,** are having extensions built to their meat factory at New Street, Miles Platting, Manchester, 10.

▶**Hughes Bros. (Manufacturers), Ltd.,** cooked meat manufacturers, are extending their factory in Hanson Road, Aintree, Liverpool, 9.

▶**Wraptyn Co., Ltd.,** aluminium foil manufacturers, are planning an extension to their factory in Lockfield Avenue, Brimsdown, Enfield, Middlesex.

▶**A. Connor and Co., Ltd.,** container manufacturers, have had plans drawn up for the construction of a warehouse at Camp Hill Industrial Estate, Nuneaton.

▶**Mackinlays and Birnie, Ltd.,** distillers, are having a four-storey warehouse erected at Blenalbyn Distillery, Inverness, at an estimated cost of £18,900.

▶**E. Massey, Ltd.,** provision merchants, have had plans approved to erect a food factory, warehouse and office premises at Blandford Street, Newcastle-on-Tyne.

▶**Hansen's Laboratory, Ltd.,** annatto and rennet manufacturers, are having plans prepared for the construction of factory premises on a site at Basingstoke Road, Reading, Berkshire.

▶A new factory for the processing of fish, fruit, vegetables and meat by dehydration and vacuum packing methods is to be erected in Tullos, Aberdeen, by **Kestrel Products, Ltd.,** who already operate a smaller pilot unit in Sinclair Road, Torry, Aberdeen. The new factory will concentrate initally on fish. Later work will cover fruit, vegetables and meat.

▶**The Weston Biscuit Co. (Edinburgh), Ltd.,** is to build a £1 million biscuit factory in the Sighthill Industrial Estate, Edinburgh. Warrant has been granted for the project which involves a modern plant on continuous production lines. The firm already have a production unit in Slateford Road, Edinburgh, and this will be continued. Work is to begin at an early date on the preliminary stages of excavation and foundation.

Food News Overseas

Japanese study Brazilian fish

Japanese technicians have been carrying out a four-months fisheries research survey along the Brazilian coast.

Bigger whale catch

The nine Norwegian whaling expeditions operating in the Antarctic have reported an output of 535,390 barrels of whale oil for the third period of the season, compared to 488,720 barrels in the same period last year. The expeditions are operating with only 94 whalecatchers against 110 last year.

Pineapple cannery re-opens

The Queensland Government has accepted proposals made by the Pineapple sectional group of the Committee of direction of fruit marketing, for the operation of a cannery in North Queensland. The cannery at Cairns, which has been closed for some time, will re-open after it has been equipped with new machinery. It will operate as a unit with similar canneries at Northgate, near Brisbane, and Koongal, Rockhampton. When pineapple production in North Queensland reaches 4,000 tons of good canning quality pineapples a year, a new modern cannery similar to that at Koongal will be established.

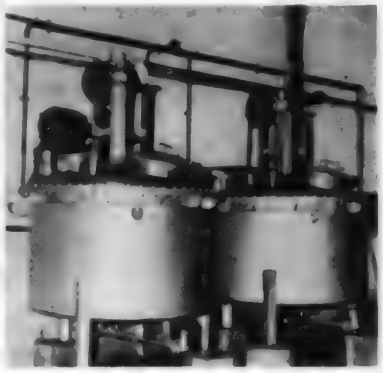
Orange juice by tanker

A new transportation method for fresh orange juice by which it may be shipped in bulk from ports of origin to centres of consumption in special tankers was foreshadowed recently in the U.S.A. where the first bulk cargo of orange juice was shipped from Bradenton, Florida to New York.

Owned by Fruit Industries, Inc., the ship, an 8,000-ton converted freighter, the *Tropicana*, carried 650,000 gal. of fresh orange juice in special stainless steel, vacuum-sealed tanks. Ultimately it is planned to carry 1,450,000 gal. on each voyage.

After docking at the company's Long Island plant, the juice was pumped ashore into stainless steel tanks, each of 55,000 gal. capacity. From there the juice was put up in cartons and delivered by refrigerator trucks to dairies in a dozen different American States and to Canada.

Mr. Anthony J. Rossi, president of Fruit Industries, states that the *Tropicana* will bring fresh orange juice to New York at nine day intervals. He plans to open similar reception plants in Boston and Baltimore before the end of the year. Eventually, he is hoping to transport orange juice in this way from Florida to ports in Europe.



Left. **Entrance to W. J. Bush's new factory in India.** *Right*. **Mixing vessels in the production plant.**

Sugar company for Ceylon

A new company with an authorised capital has been floated in Ceylon to plant and manufacture sugar. The title of the company is Ceylon Sugar Plantations, Ltd. Rs. 275,000 have been subscribed by the eight directors and the company is now inviting public subscription for Rs. 600,000 which the Ceylon Development Finance Corporation has agreed to underwrite. The new company has secured the assistance of a Dutch firm of sugar millers and two Dutch experts. It aims to produce about 1,000 tons of sugar annually in three years time. Eighty acres have already been planted on land acquired by the firm and an open pan processing plant is to be installed which it is expected will be in production by July.

Eire imposes duty on wheaten foods

A customs duty of 100% (full rate) and 66⅔% (full rate)—preferential—U.K. and Canada has been imposed on prepared wheaten breakfast foods by the Government of Eire.

At the same time the Minister for Industry and Commerce made an order removing the prohibition imposed by the Agricultural Produce (cereals) Act 1938, on imports of these foods.

W. J. Bush open factory in India

W. J. Bush and Co., Ltd., opened their latest factory for producing non-alcoholic essences, liquid colours and perfume compounds in Nellikuppam, Madras, South India, recently.

As much of their raw material as possible will be obtained from Indian sources. In due course the company will develop manufacturing plants to produce a large variety of raw materials from basic ingredients purchased in India.

The factory, which will manufacture under the name of W. J. Bush Products (Private), Ltd., was inaugurated by the Union Deputy Minister of Health, Mrs. Margatham Chandreshekaran, before leading citizens and businessmen. Mr. A. J. McIntire and Mr. T. Love, managing director and general works manager respectively of the parent London company, which celebrated its centenary in 1951, travelled to India for the opening ceremony.

Following a conducted tour of inspection and the cutting of a ribbon to declare the factory open, Mrs. Chandreshekaran said that India with its wide range of climatic conditions was well suited for the cultivation of aromatic plants. She concluded, "I am happy that the factory which Bush and Co., Ltd., have established at Nellikuppam will be progressive and will employ adequate numbers of Indian technical staff."

In welcoming guests to the factory Mr. G. N. Noel-Todd, chairman of Parry and Co., and of the board of directors of W. J. Bush (Private), Ltd., said that the factory represented an outstanding example of Indo-British co-operation.

Packaging

To mark the centenary of Peak, Frean and Co. Ltd., Richard Lonsdale-Hands have designed a new biscuit tin. Both on the lid and round the edge, the tin is decorated with a ring of medals, won by the company at International Exhibitions. They are printed in gold against a red background.

New export packaging service

A special packaging service for manufacturers selling in overseas markets is being operated by Evans Chemicals, Ltd.

It offers packaging facilities for liquid, granular and powder products and has been designed to assist manufacturers who may be having difficulty in meeting promised delivery dates. It is also available to assist concerns already working to full capacity who receive additional orders, providing them with packaging facilities on a sub-contract basis.

Cellulose film exports

The U.K. is the world's largest exporter of cellulose film, although the U.S. output exceeds that of all other countries combined, reports the Transparent Cellulose Wrappings Committee.

British exports of transparent cellulose film reached a record level in 1956. The previous record was in 1948 when 19 million lb. were exported. Last year's exports approached 22 million lb., valued at £4¼ million sterling. This represents more than a quarter of the output of the industry, whose product is used mainly for protective packaging, especially for foods and confectionery.

In addition about a quarter of the film sold in the U.K. is used for goods sold abroad. Consequently, in 1956, nearly half the industry's production was exported directly or indirectly.

Only 25 years old, the industry is comprised of four companies, each with one factory: British Cellophane, Ltd. (Bridgwater, Somerset); British Rayophane, Ltd. (Wigton, Cumberland); British Sidac, Ltd. (St. Helens, Lancashire); and Transparent Paper, Ltd. (Bury, Lancashire). The industry did not get into its stride until after the last war. Between 1946 and 1956 it quadrupled its output to about 80 million lb. a year.

In the last 10 years direct exports have been doubled despite acute competition and trade restrictions of all kinds. In the earlier post-war years many more export markets were open to the industry than today, but since then various countries have set up or expanded their own factories. These include Canada, Sweden and Mexico where new production has been established with the backing of British capital and know-how. Moreover, many more countries are exporters of cellulose film. Apart from the U.K. the principal exporting countries are U.S.A., France, Western Germany, Belgium, Italy, Japan and Canada.

About two-thirds of the industry's exports are to the sterling area, and the balance to almost all other countries with which the U.K. has trading relations.

The largest producer in the industry, British Cellophane, Ltd., is now building its second factory at Barrow-in-Furness, Lancashire, which is planned to start production in 1959. In 1955 British Cellophane's own direct exports reached a record figure of more than 10 million lb. This record itself was exceeded by nearly 30% in 1956 when the company's direct exports totalled about 13 million lb. or about two-thirds of those of the whole industry.

A new pack for Lyons "Milk Chocs" which won a first prize at the recent Packaging Exhibition. The pack, designed by the Design Research Unit, comes in an outer suitable for counter and window display. Four flavours are included in each carton — lemon, lime, tangerine and coffee.

Economical tube packing

Reductions in the costs of packing products in collapsible metal tubes are now possible as a result of research by members of the Collapsible Tube Manufacturers' Association.

Addressing the Manchester branch of the Institute of Packaging recently, Mr. J. G. Wilson, of the C.T.M.A., said that enamels which have more resistant properties than the old oil-based coatings have now been introduced for tube decoration and that they often eliminate the necessity for special and additional coats. At the same time "a great deal of thought has been given to the shoulder of the tube and full use has been made of the inherent properties of the metal itself," Mr. Wilson added.

"New means of providing a satisfactory closure have also been developed and tube users are now saving money in many instances by using these wadless closures."

Several well-known tube-packed products had changed their cap shape, continued Mr. Wilson, the main external difference being that instead of the conventional-shaped cap, a range of conical shapes had replaced them, in many cases the wad or liner having been rendered obsolete. Conical caps made from polythene are now firmly established.

Referring to the industry's recent endeavours to help its customers, Mr. Wilson said: "We are now in a position to take a product and by a series of tests to forecast its behaviour in any type of tube.

Instead of filling a number of tubes and stacking them on a shelf to see what happens after six or twelve months, accelerated tests are now made as standard. By these tests we can tell users in a very short time indeed what type of tube we would recommend."

Paper sacks in a hurry

Record production work has been achieved, announce William Palfrey, Ltd., in turning out an order from Imperial Chemical Industries for 20,000 *Palfsacks* (multi-wall paper sacks) for use as salt containers. This was an order from Tasmania. The order for the sacks—special 5 ply of 1 cwt. size—was placed on December 28 with the request for urgent delivery by January 8, as the ship on which they were consigned closed on January 11. The sacks were ready by January 7, rushed from Rochester to Cheshire by road, filled and well aboard before the ship's closing date.

Lacquers on tinplate

Research into the effects of the oxide film which forms on tinplate was discussed by Dr. W. E. Hoare, assistant director of the Tin Research Institute, at the Sixth Annual Tin Conference organised by the Centre d'Information de l'Etain in Paris recently.

"A high proportion of tinplate," said Dr. Hoare, "has a steel base of closely controlled chemical analysis and metallographic structure; a tin-coating thinner than half-a-micron and carefully controlled artificial oxide and oil films. Such precisions necessitate disciplines and controls. They are necessary, both for the sake of the production of the material itself, and also because an increased proportion of tinplate is now lacquered.

"This vastly increased use of lacquer coatings is due in great part to the necessity to reinforce the protection afforded by the rather tenuous tin coatings now so widely used. It may be asked whether the economy in tin secured is always worth the cost of the extra protection and extra process control that it demands."

Polythene coated bags

Facilities for the production and delivery of *Telcothene* polythene coated paper bags up to 10 in. wide and 20 in. long, have been announced by the manufacturers, Robert Peters (Nottingham), Ltd.

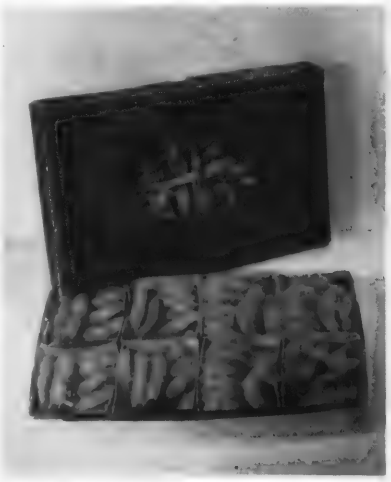
Various types of paper lamination are available, having slightly different characteristics: bleached kraft; M.G. kraft; vegetable parchment and *Glassine*, all having a polythene face and printed when required by a flexographic process in one or two colours.

The outstanding advantage of these bags is of course their strength and rigidity which makes them suitable for unit packing heavy and fluid powders. The bottoms of the bags are sealed twice thus militating against sifting, and they can be heat-sealed along the top.

Other valuable characteristics are that the material is unaffected by water or inorganic chemicals in solution and no deterioration is suffered by the materials packed. This is particularly important for pre-packing food where decorative and protective qualities are important. *e.g.* cereals, biscuits, custard and lemonade powders, cocoa, etc.

Samples are available on substance of double crown D.C.16, coated with 0·001 *Telcothene*.

The "Skey Can"—a new key-opening can designed for production on fast automatic lines by the Metal Box Co. It is said to be an ideal tamperproof container for dry and powdered foods and beverages, for spreads and confectionery, and a wide variety of products calling for gas, vacuum or atmospheric packing, high speed filling and automatic closing. The container has a built-in plug lid reclosure held captive by a hinge.



Cooked shrimps are being marketed in France by Casacrus of Cannes. They are first boiled, then packed in 4 oz. "Cellophane" portions in a 2 lb. carton.

Said to be the first time celery has been available as a soup mix, this new Batchelor line has just been marketed in a bright, foil packet selling at 1s. Each packet holds 1¾ oz. of soup mix and will produce 1 pint of soup containing pieces of white celery and chopped celery leaf.

Conical closures for tubes

In addition to their collection of plastic caps for collapsible tubes, Universal Metal Products, Ltd. now offer a range of conical caps. They can be supplied either with wads or with the patented U.M.P. wadless closure. This latter range of caps is also available in polythene.

All U.M.P. polythene caps are provided with a tested and approved buttress type thread combining safety and efficiency.

Pre-packaging developments

More Scottish produce firms are pre-packing their goods. Gavin Hamilton, Ltd., of Hamilton, potato merchants, are selling potatoes in plastic sacks under the brand name of *Gav-Ham*.

Bartlett and Sons of Coatbridge, beetroot boilers, are packing cooked beetroot and carrots in polythene sacks and are proposing to extend their range when they occupy their new factory within the next six months.

Glenfox, Ltd., are producing pre-packed turnips and stewpacks (onions and turnips) as well as some 30,000 packs of potatoes every week.

D. W. H. Cargill of Benholme is marketing *Golden Eagle* packs of potatoes and a limited amount of fruit and vegetables.

Forbes F. Mackenzie of Rothes have included pre-packed carrots, cabbage, turnip, mixed vegetables and onions in their range.

New Companies

Anglo-American Produce Co., Ltd. (576544.) £10,000. Subs.: T. C. Robey and A. E. I. Menzies, 3, Finch Lane, Cornhill, London, E.C.3.

F. and R. Chicken Products (Devon), Ltd. (574300.) 51-53, High Street, Newton Abbot, Devon. Dairymen, cheese, butter and egg merchants, poultry breeders, bacon curers, etc. £1,500 Dirs.: Mrs. E. L. Farmer and R. Radziwillowicz.

General Commercial Co., Ltd. (574553.) 30, City Road, London, E.C.1. Importers, exporters, packers, distributors, dealers in and brokers of tea, coffee, cocoa, groceries, etc. £5,000. Dirs.: F. W. Culverhouse and E. V. Mehew.

Hale, Hamilton (London), Ltd. (574210.) 16, Berkeley Street, London, W.1. Mfrs. of and dlrs. in confectionery, etc. £5,000. Dirs.: D. E. Andrews, J. D. Hamilton, and A. G. Wood.

Just Squeeze Juice Co., Ltd. (574597.) Producers of fruit juice and vegetable juices, etc. £100. Subs.: J. S. Bennett and J. R. S. Hadfield, 18, Austin Friars, London, E.C.2.

Klosters (Patisserie), Ltd. (577047.) 52, Dean Street, London, W.1. Biscuit mfrs., bakers, confectioners, etc. £100. Dirs.: M. D. and C. Mainwaring-Evans.

M. A. Nicholson, Ltd. (576967.) 38, Church Street, Seaham, Co. Durham. Bakers, etc. £10,000. Subs.: D. and F. Morris.

Preston Prepacking Produce Co., Ltd. (574256.) 9, Chapel Street, Preston, Lancs. Fruit and vegetable, egg, poultry and game and rabbit merchants, dealers and packers, etc. £100. Dirs.: T. S. and Mrs. M. Watson, G. T. Ormerod.

Processed Australian Meats, Ltd. (574478.) To export, import, manufacture and deal in meat and meat extracts and to produce foodstuffs of all kinds. £100. Subs.: E. A. Clarke and M. A. West, 5, New Court, London, W.C.2.

Solway Ices, Ltd. (576829.) Foxhanger, Burwash, Sussex. Mfrs. of and dlrs. in ice cream and ice cream products, proprs. of milk and coffee bars, etc. £5,000. Dirs.: A. and Mrs. A. Nutter, J. and Mrs. C. M. Lawson.

Thompson and Moore, Ltd. (574487.) The Wholesale Market, Barnsley, Yorks. Importers of and exporters of and dlrs. in fruit, vegetables, etc. £4,000. Dirs.: B. Thompson and G. Moore.

Tunes, Ltd. (576468.) Dundee Road Trading Estate, Slough, Bucks. Mnfrs. of and dlrs. in food, food products and confectionery products (medicated and non-medicated). £100. Dirs.: C. E. Pratt and E. L. Halliwell.

Wine from the Wood, Ltd. (574225.) 3, Cork Street, London, W.1. Wine merchants, etc. £1,000. Dirs.: J. K. Malcomson, P. L. Waddell, and Jean A. Mauroux.

W. D. Warren, Ltd. (570469.) Ham and bacon curers, meat mnfrs., butchers and grocers. £20,000. Subs.: J. G. Hodder, Hall Street, Brierley Hill, Staffs (solr.), and Edith Fletcher (clk.).

James W. Wood, Ltd. (570203.) Westborough Chambers, Maidstone, Kent. Baker, confectioner, grocer and provn. mcht. £100. Permt. dirs.: J. W. and Mrs. K. D. Wood.

From Jordan and Sons, Ltd., Company Registration Agents, 116, Chancery Lane, London, W.C.2.

Technical Press Review

APRIL

Dairy Engineering.—An Underground Milk Reception Plant; Stainless Steel *v.* Wooden Butter Churns; Glass Bottles Serve the Dairy Industry; Orange Drink Production for the Dairyman; Personnel Management and Automation in the Dairy.

World Crops.—Cotton Production in the U.S.A.; the Empire Cotton Growing Corporation; Rubber—the Plant with 50,000 Uses; The Art of Budgrafting; The Mechanical Harvesting of Tea Leaf.

Automation Progress. — Recent American Developments in Digital Machine Tool Control; Automatic Shunting of Goods Waggons; Pneumatic Control and Power; Character Recognition Procedure; Control Plant for World's Largest Nuclear Power Station; Education of Soviet Engineers; Special Purpose Machines.

Manufacturing Chemist.—Gelatin Capsules and their Manufacture; Fatty Acyl Alkylolamides, 2; Sugar Cane Wax; A Century of British Fertilisers; Progress Reports: Analytical Chemistry, Cosmetics, Pest Control.

Paint Manufacture.—The Paint Industry in Perspective; Safety and Welfare in the Paint Industry; Fire Precaution: The Arrangement of Canteen Facilities; Planning a Pension Scheme; Inspecting Paint; Emphasising Safety with Photographs.

Chemical and Process Engineering.—Explosion Risks in Industry; Safety Matters; How to Read Engineering Drawings—2; The Installation and Maintenance of Thermoplastic Pipes; Ebonite as a Material of Construction for Chemical Plant; Rayon Pulp from Wood.

Atomics.—Treatment of Highly Active Wastes; Chemical Processing of Nuclear Fuels; Ion Exchange and Atomic Energy; Chemical Aspects of Nuclear Power—1; Engineering Problems of Nuclear Power—1; Zirconium and Nuclear Power.

Petroleum.—Geology of the Middle East; Rust Preventatives from Petroleum; Corrosion in Oil Refinery Effluent Plants; Preventing Corrosion caused by Crude; The Value of Cathodic Protection.

For specimen copies, write to Stratford House, Eden Street, London, N.W.1.

Trade Marks

AROMATS.—752,935. Chocolate and non-medicated sugar confectionery. **R. Barnett and Co., Ltd.,** 53, Hartley Road, Nottingham.

BIRDS.—749,507. Self-raising flour; pie crust; and pastry, cake, scone and pudding mixtures. **Alfred Bird and Sons, Ltd.,** Devonshire Works, Deritend, Birmingham, 12.

BISKOVITE.—754,381. Foodstuffs for animals. **Koninklijke Verkade Fabrieken N.V.,** Westzijde 103, Zaandam, Holland, and c/o Wildbore and Gibbons, 101, Leadenhall Street, London, E.C.3.

CARAMILK.—752,830. Chocolate in bar form containing milk. **Van Houten, Ltd.,** Chesham, Bucks.

CARA-SET.—752,202. Food preparations for making jellies, blancmanges and similar desserts. **Creamola Food Products, Ltd.,** 114, Cornwall Street, Glasgow, S.1.

CHOCOLUX.—751,926. Non-alcoholic beverages containing chocolate. **Edward Hack,** Lion House, Red Lion Street, London, W.C.1.

CHOC-SET.—B752,203. Preparations containing cocoa for making blancmanges and similar desserts. **Creamola Food Products, Ltd.,** 114, Cornwall Street, Glasgow, S.1.

CIDOTON.—744,033. Non-alcoholic beverages containing apple juice. **E. Spooner and Sons, Ltd.,** Pwll Street, Landore, Swansea.

CLOVERKIST.—753,530. Butter. **Siddall Bros., Ltd.,** Wesley Street and Manor Street, Fenton, Stoke-on-Trent.

CRELL.—753,408. Edible cooking fat. **The British Margarine Co., Ltd.,** 1, 2 and 3, Cornwall Road, London, S.E.1.

CRESSWELLS.—742,767. Non-alcoholic fruit flavoured beverages, tonic water, ginger beer and aerated beverages (non-alcoholic); all being goods for sale in the counties of Stafford, Warwick and Worcester. **Cresswell (Smethwick), Ltd.,** 4-10, Ford Street, Smethwick, Staffs.

DEL OMAR.—753,344. Marmalade, jams, lemon curd and mincemeat. **Spring and Co., Ltd.,** Riverside, Brigg, Lincs.

DOFOS.—754,595. Foodstuffs for animals and for birds. **Dog Foods (Edinburgh), Ltd.,** Newhaven Place, Newhaven, Leith, Edinburgh,6.

DUTCH ROSE.—754,456. Canned meats. **N. V. L. G. Steegstra's Conservenfabriek,** Odijkerweg 2, Driebergen, Holland, and J. A. T. Caton and Son, Monument Station Buildings, London, E.C.4.

EXCHOC.—751,920. Chocolate flavourings. **Edward Hack,** Lion House, Red Lion Street, London, W.C.1.

FARMKIST.—755,155. Dried fruit. **Mayfair Packing Co.,** 2070, South Seventh Street, San Jose, California, U.S.A., and c/o T. B. Browne, Ltd., 117, Piccadilly, London, W.1.

GIPSY.—744,468. Edible fats and edible oils. **James Crean and Son, Ltd.,** Atlas Works, Naylor Street, Liverpool, 3.

GOLDENFLO.—754,303. Non-alcoholic drinks and preparations for making such drinks, and fruit juices. **Dickon Hall Products (Proprietary), Ltd.,** Mataffin, Eastern Transvaal, S. Africa, and c/o McKenna and Co., 12, Whitehall, London, S.W.1.

GRENADIER.—752,614. Port wine. **Findlater Mackie Todd and Co., Ltd.,** Findlater House, 90-92, Wigmore Street, London, W.1.

Information and Advice

This Service is available to subscribers to FOOD MANUFACTURE. If a stamped addressed envelope is enclosed replies will be sent by post. Enquiries cannot be answered by telephone.

Icing sugar

B.8106. *Please advise us on the production of icing sugar.* (Molteno, South Africa)

Icing sugar is made by grinding rough sugar crystals of various sizes in a sugar mill to produce a fine powder which can pass through a silk screen. When the presence of starch is not objected to, about 0·5% of cornflour can be added during grinding and will help to give a free-running sugar. This would be subject to local regulations on this point.

Mint jelly

B.8110. *Please give us a recipe for mint jelly.* (Inverness)

The following recipe is recommended by Poultney ("Vinegar Products"):

Sugar	8 lb.
Glucose	8 ,,
Pectin	7 ,,
Malt vinegar	1½ pints
Acetic acid	1 fl. oz.
Dried mint	½ lb.
Green colour as required	

The product is a solidified mint sauce, taking advantage of the setting power of pectin in association with sugar and acetic acid.

Sieve the dried mint and place with the other materials in a cooking pan and heat to 220°C. Allow the jelly to cool, or preferably put it over a jam cooler, to a temperature of 150°F., before pouring into jars. If the jelly is poured at too high a temperature, the mint will rise to the surface of the jars leaving clear jelly beneath.

If you require a softer jelly, cook to a lower temperature, but the jars, after filling and cooling, must be placed in a hot room for at least 24 hr. to reduce the moisture content at the surface. Otherwise mould will develop.

You can obtain a clear jelly by first boiling the dried mint in the vinegar for several minutes, filtering through a flannel bag and using the resulting extract, made up to its original volume with malt vinegar, with the remaining ingredients as described. A mint essence could be used instead of the dried mint.

Coffee powder

B.8145. *Please give information on the manufacture of coffee extract.* (Sunderland)

In the preparation of soluble coffee, both the blend of beans and the type of roasting have a definite bearing on the quality of the finished product. The type of grind is also important to get the maximum yield.

Extractors used comprise a number of tanks with perforated bottoms and connected in series for counter-current operation. Hot (140°-200°F.) water is pumped into the percolator containing coffee that has been most completely extracted and allowed to stand for 1 to 1½ hr. It then flows to the next (less completely extracted) unit, and so on until the concentrated extract is discharged from the last, most recently charged percolator. Operating pressures in the extractors are usually from 30 to 50 p.s.i. The amount of water used is generally one part to two parts of ground coffee.

The above is a batch operation in that the different units must be charged with fresh coffee and the exhausted grounds discharged. A continuous extractor is therefore coming into use in which ground coffee is charged continuously at one end and moves slowly, by means of impeller blades and slotted weirs towards the discharge at the other end, while water travels counter to the movement of the coffee.

The extract generally contains from 32 to 38% soluble solids. If lower than this, the extract is vacuum evaporated. The spent grounds are steamed and additional material thus obtained is vacuum concentrated and added to the extract. The extract is clarified either by centrifuging or by filtering through plate and frame presses, the former method being a continuous process. The extract is generally spray dried, though vacuum drum driers and belt driers may also be used. One hundred lb. of roasted coffee should yield from 25 to 35 lb. of soluble coffee.

Information supplied

The Enquiry Service has dealt with requests for names of manufacturers and suppliers of plant, machinery and materials, and also general information as follows:

B.8027. *Manufacturers of meters for measuring water volumetrically.* (Eire)

B.8028. *Information on manufacture of coarse grade flour.* (Patrington, Yorks.)

B.8029. *Information on synthetic cream.* (London, W.1)

B.8030. *Information on film wrapping of cake.* (Liverpool)

B.8031. *Information on food organisation societies in N.W. England.* (Liverpool)

B.8032. *Manufacturers of machines for peanut butter.* (Kenya)

B.8033. *Information on canning creamed rice.* (Ireland)

B.8034. *Suppliers of liquid frozen eggs.* (Fraserburgh, Scotland)

B.8038. *Information on the preparation of seelachs.* (Denmark)

B.8041. *Manufacturers of apple peeling machine.* (Belfast)

B.8042. *Manufacturers of a vacuum sealer.* (Glasgow)

B.8043. *Manufacturers of dehydrated mushrooms for soup powders.* (Auckland, New Zealand)

B.8046. *Information on vacuum packing cooked meats.* (Canada)

B.8047. *Information on vacuum packing machine.* (Aberdeen)

B.8048. *Information on Hungarian food industry journal.* (Cambridge)

Recent Patents

COMPLETE SPECIFICATIONS ACCEPTED

772,951. National Tea Packing Co., Inc.: Manufacture of filled packages with string handles and tags.
772,773. P. J. R. and R. P. J. Tapp: Vehicles for transporting frozen commodities.
772,957. Food Machinery and Chemical Corporation: Method and apparatus for filling powdered materials into containers.
772,562. G. H. Teesdale: Bottle wrappers.
772,354. Auto-Klean Strainers, Ltd.: Filters for removing fine particles from liquids.
772,285. Ruhrchemie A.G.: Containers for food.
772,062. G. J. Malacki: Preservation of colour in canned green vegetables.
772,385. A.B. Svenska Flaktfabriken: Apparatus for pneumatic transporting of grain or similar materials.
772,280. Soc. Parisienne d'Expansion Chimique, S.P.E.C.I.A.: Automatic bottle-filling machine.
771,758. Eldorado Ice Cream Co., Ltd.: Production of ice cream.
771,361. J. P. Todd, J. Hawthorn and J. A. Blain. Manufacture of bread.
771,364. W. P. Wadsworth and Sons: Pulling machines for toffee and like confectionery.
771,365. Pye, Ltd.: Temperature controlled oven assembly.
771,682. P. M. I. Komierowski: Machines for bread buttering.
771,601. J. G. Roberts: Food products.
771,606. G. Wienholt: Method and means for making eccles cakes.
771,608. Atlas Equipment (London), Ltd.: Apparatus for the production of twisted bread loaves.
771,611. F. Laska: Meat cutting and mixing machine.
771,612. Baker Perkins, Ltd.: Devices for transferring articles from one bakery unit or conveyor means to another.
771,697. Redler Conveyors, Ltd.: Conveyors for grain or equivalent.
771,378. Unilever, Ltd.: Preparation of quick-cooking cereal products.
771,845. A. B. Thorell and Persson: Sausage grilling and vending machine.
771,552. A. S. Brodrene Hartmann: Packages for the storage of fragile articles such as eggs.

ABSTRACTS OF BRITISH PATENTS

Ice cream manufacture

A carton blank is formed to channel shape and moved past a nozzle which extrudes ice cream, etc., into the channel. The blank is then bent around the ice cream, and its edges are secured together.—763,265. *Lyons and Co., Ltd.*

Biscuit wrapping machine

Elongated packets of biscuits, etc., move in transverse disposition through a wrapping machine, and the final side-tucking operation is effected, while the packet is stationary at the end of the machine, by tuckers shaped to conform to the rearward faces of the packet.—763,462. *Forsters Machine Co., Ltd.*

Bacon wrapping machine

Flat articles, *e.g.* bacon slices, are wrapped in a sheet of wrapping material and sealed by heated clamps during the intermittent movement of the package through the machine.—764,453. *Package Machinery Co.*

Coconut flesher

A curved knife blade is rotatable by power drive about the axis of the shank of the blade, which is secured in a holder and is insertable into a coconut, etc.—764,431. *H. D. Rey.*

Sausage casing

A thin casing is shirred to form pleats by applying a shirring force to the casing over a short length relative to the diameter.—764,455. *Transparent Package Co.*

Gravity feed meat slicer

An electric motor drive is arranged to give the meat-carrier a faster return stroke than its cutting stroke.—764,469. *H. Fehlmann.*

Steriliser and pasteuriser

Goods in containers (*e.g.* tinned foods) are sterilised by being passed through a W-shaped conduit filled with steam at suitable temperature by an endless conveyor belt which has carriers projecting at right angles to the direction of the movement. The lower apices of the W act as steam traps.—764,554. *Stork and Co.'s Apparatenfabriek N.V.*

Olive washing machine

Olives are centrifugally washed and separated from other fruits, dirt, etc., in a shallow basin whence the olives only are dispersed to collecting trays, their specific gravity varying from the residue.—764,565. *G. Diefenbach.*

Fat separation

Free-fat-containing materials are conditioned after being released by high frequency vibration to a temperature immediately below the coagulating point of the protein material in the free fat portion, while maintaining the fat in a molten state, passed through a screen of mesh capable of separating the major part of the solid particles and centrifuged to separate fat from blood, soluble albumen, etc.—764,343. *S. A. Frigorificos Anglo.*

Food products

A firm, rigid material containing foodstuffs is prepared by dispersing the foodstuffs in an aqueous colloidal solution which sets to a heat irreversible gel, shaping the gel and subjecting to a radical temperature change (cooking or freezing and thawing) without change of shape. The process is particularly used to produce artificial potato chips.—766,878. *E. J. Rivoche.*

Fish filleting machine

The fish are displaced between upper and lower conveyor belts in casings each incorporating a flat filleting blade having a piercing point at the convergence of filleting edges.—765,618. *A Gradoff.*

Feather plucker

Conical projections on a rubber, etc., rotor are sufficiently elastic to bend against the drum surface.—765,637. *S. W. McKendree.*

Beer production

Wort is removed from a mash by introducing water upwardly into the mash and continuously withdrawing wort from the top of the mash. The apparatus comprises a receptacle for the mash and means for introducing water and drawing off wort.—765,224. *A. Z. Metz.*

Confectionery production

A powder drying apparatus combined with a Mogul machine comprising a conveyor for moist powder separated from confections in the Mogul, a feeding device for diverting moist powder by means of a heated air stream to a separator and means for feeding the dried powder to the moist powder being conveyed to the mould boxes.—765,230. *R. Winkler.*

Dietetic sweetmeat

A sweetmeat in the form of a rigid edible gel is produced by preparing in suitable proportions a mixture of agar agar, methyl cellulose and water, preparing a wet base comprising sugar (preferably 75% invert syrup) and water, adding further sugar and heating to 245°F. while stirring, allowing to cool, adding the first mixture, boiling, then allowing the mass to cool. Flavouring or colouring may be added.—767,013. *B. Samuels.*

Frozen confectionery

Ice cream, etc., in a cup-shaped mould has a cavity to receive *e.g.* differently flavoured ice cream formed therein by a heated plunger die. The latter is connected to an air supply, and an air blast assists the removal of the die from the ice cream and stabilises the cavity.—765,277. *M. Sedutto.*

Control system

In an electrical, etc., system for testing articles (*e.g.* dough balls for constant weight within upper and lower limits) an integrating device responds differentially to two outputs produced by variations outside said limits. Controlling means respond to the output of the device when it is above a given value, this output being decreased with the passage of time so that recently tested articles have a greater effect on the system.—767,081. *Sargrove Electronics.*

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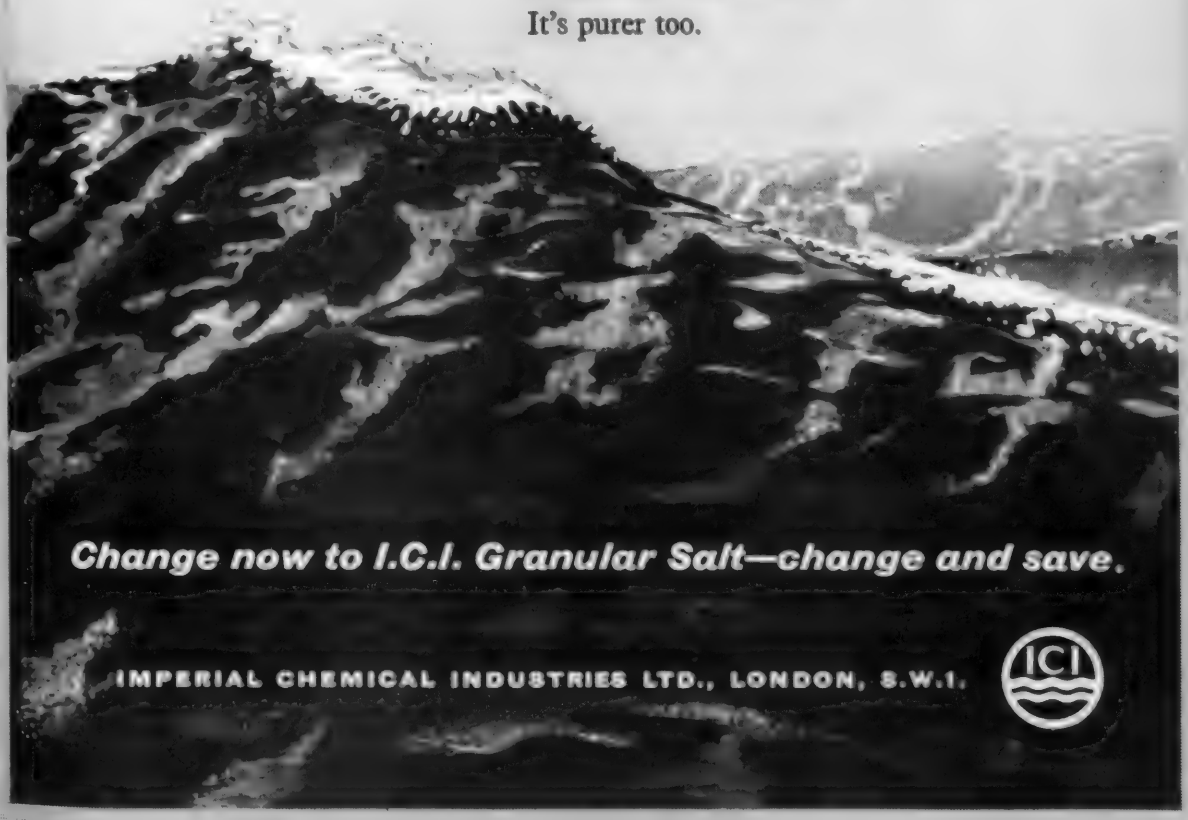

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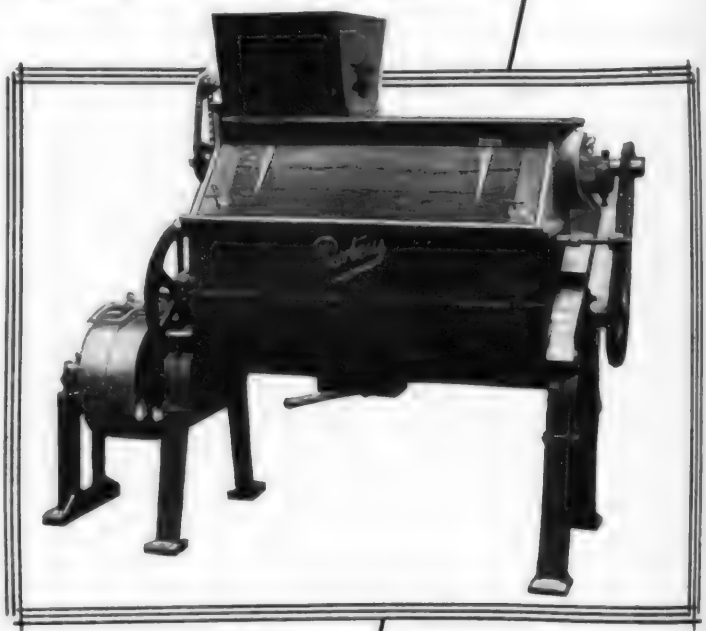

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GP. 124

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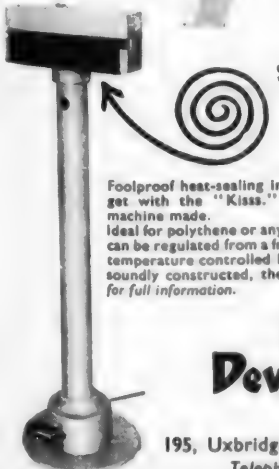

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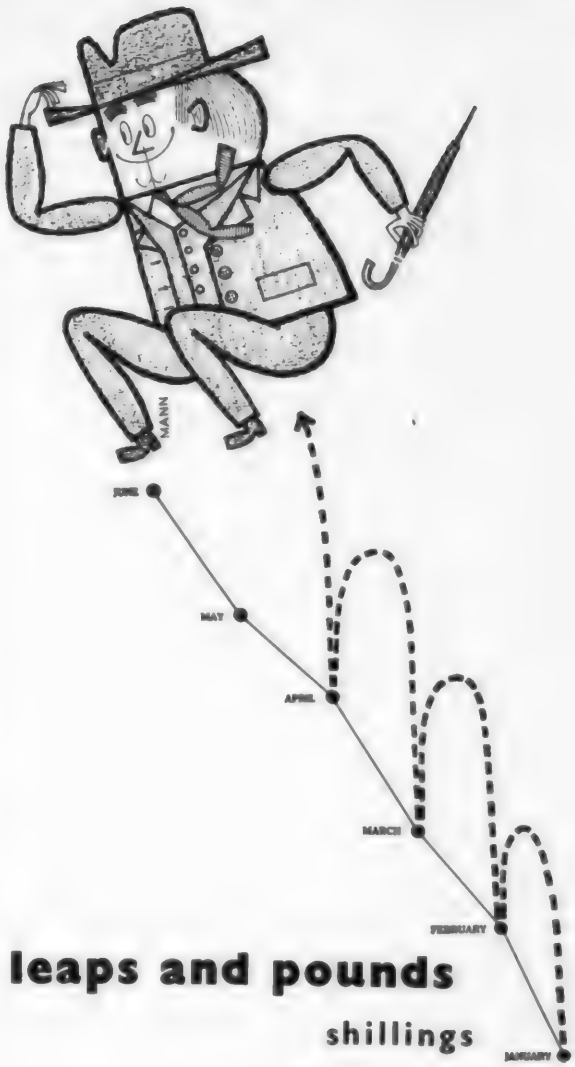

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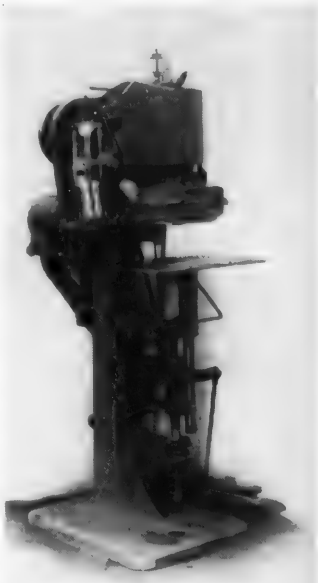

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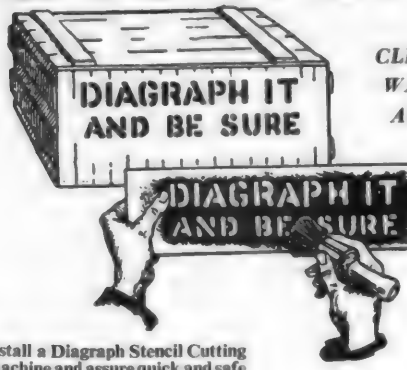

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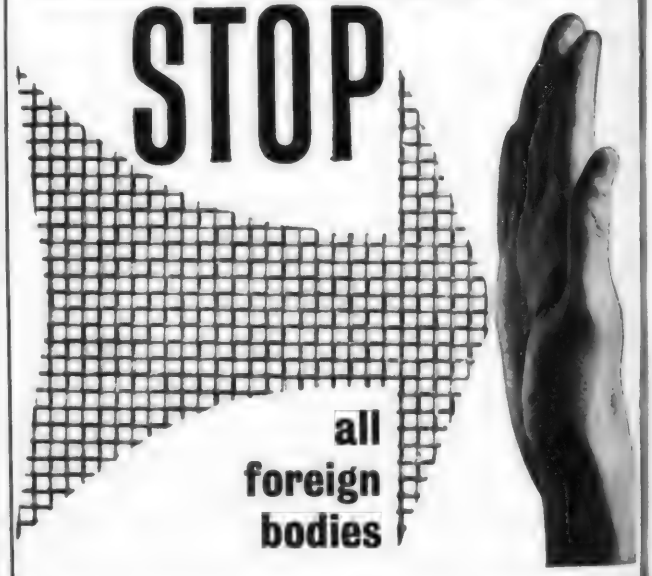

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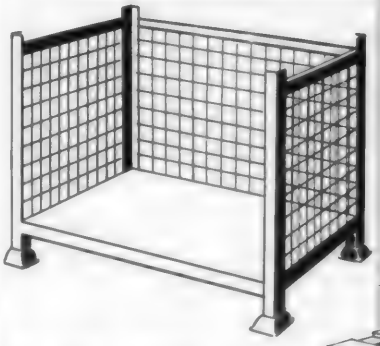
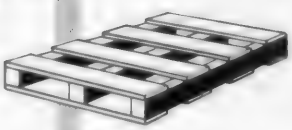
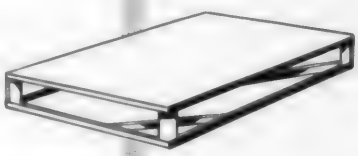


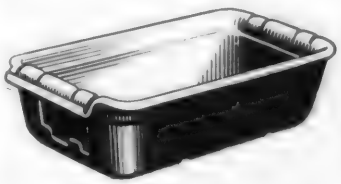
Cage type Stackable Pallets, suitable for cartoned foods, biscuits etc.



Flat Timber Pallets for handling and storing cartoned foodstuffs etc.



Flat Reversible Steel Pallets for handling cartoned foodstuffs, bottled or tinned foods etc.



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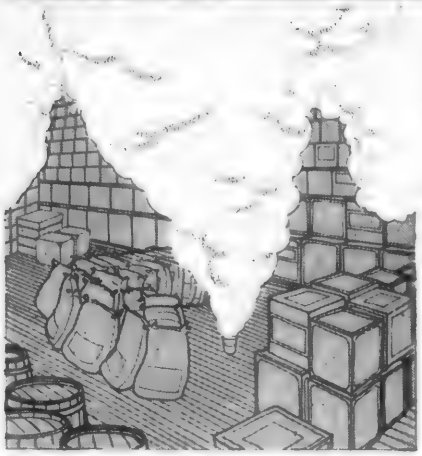

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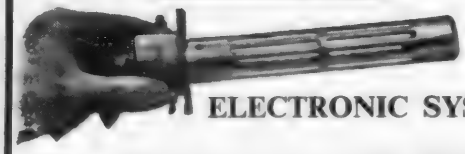

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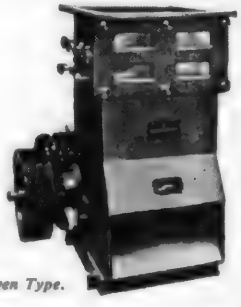

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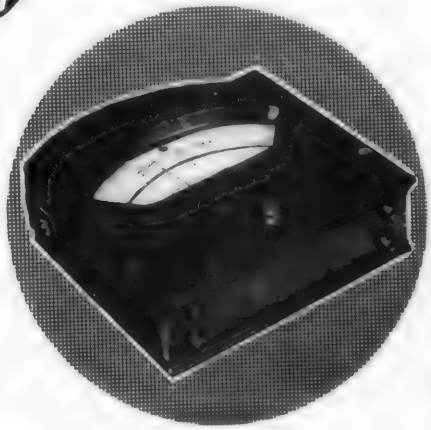

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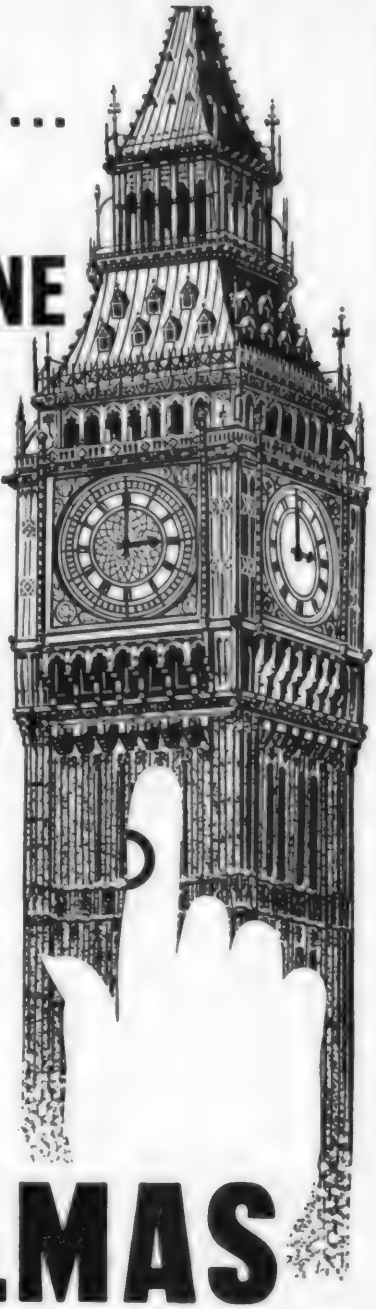

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FOOD Technologist wanted to take control of small Laboratory.—Ambassador Food Co. (London) Ltd., Springfield Road, Hayes, Middlesex. Tel.: Hayes 3957.

A CHEMIST over 27 years required by national canners and quick freezers in their East Midlands factory, to manage the Laboratory under the direction of the Chief Chemist. Experience in canning and ability to control staff essential.—Write giving full details to Box B5499.

CHEMIST, A.R.I.C. (experienced food production, preferably knowledge of Confectionery) required by Chocolate Manufacturer, Glasgow. Good salary according to qualification and experience. Pension Scheme and Life Assurance.—Write 1332, Wm. Porteous and Co., Glasgow.

YOUNG man, aged about 28 or less, wanted for Development and Quality Control work concerning breakfast cereals and cake mixes. Experience in cereals and baking technology, or in the food industry generally, an advantage. The candidate will assist in planning and performance of systematic investigations; in this respect a person with scientific training preferred. Commencing salary up to £650—according to experience and qualifications—with rising scale. Five-day week. Non-contributory pension and contributory life assurance schemes and other attractive benefits. Good accommodation prospects for London man.—Please write, with details of age, qualifications and experience to Personnel Manager, Nabisco Foods Ltd. (formerly Shredded Wheat Co. Ltd.), Welwyn Garden City, Herts.

A SAUSAGE-ROOM Foreman is required by West Country firm of Meat Product Manufacturers. Applicant must be fully conversant with all aspects of large-scale manufacture and should write giving full details of experience, age, and salary required.—Box B5483.

CONFECTIONERY Manufacturers require for their London factory a Development Executive with considerable experience in Boilings, Toffees, Starch and French products. The position is permanent, superannuation scheme is available, and the salary would be commensurate with experience. Applications treated in strictest confidence. Write giving full details of experience, qualifications, age and salary required.—Box B5488.

MANAGEMENT SELECTION LIMITED have been retained to advise on the selection of the

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for a medium-sized biscuit manufacturing company in N.W. England. The person appointed will be in sole executive control of all activities of this expanding Company, which is part of a nation-wide group.

Candidates must have general management experience in a consumer goods industry selling fast-moving products via the grocery trade. Knowledge of the biscuit trade is desirable, but not essential.

Salary subject to negotiation but remuneration will be not less than £4,000 plus appropriate benefits. Preferred age 35 to 45.

Please send brief details in strict confidence to R. A. Denerley (AH 254), Management Selection Limited, 17, Stratton Street, London, W.1. No information will be disclosed to our clients until candidates have been told their identity and have given permission after full discussion.

CHEMIST (Research) wanted for old established London Company distilling and compounding Essences and Fruit Concentrates. Progressive position. State experience and salary required. Superannuation available.—Box B5478.

CHIEF Designer for Food and Allied Machinery required by well established engineers, Eastern Counties. Applications, treated in strictest confidence, must state age and give full particulars of past experience, also salary required.—Box B5476.

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Applications are invited for Imperial Chemical Industries Limited Research Fellowships in Bacteriology, Biochemistry, Biomolecular Structure, Botany (Plant Biochemistry and Biophysics), Chemical Engineering, Chemistry, Chemistry of Leather Manufacture, Chemotherapy, Colour Chemistry and Dyeing, Engineering (Civil Electrical or Mechanical), Fuel and Refractories, Geology (including Geochemistry), Metallurgy, Mining (Selective Flotation and Geophysical Surveying), Pharmacology, Physics, Physiology or Textile Industries (Chemistry of High Polymers (keratin and man-made fibres), Textile Technology and Textile Engineering). The Fellowships will be of an annual value within the range £600-£900 a year according to qualifications and experience and will normally be tenable for three years.—Further particulars can be obtained on request. Three copies of applications (one in the case of applicants from overseas), together with the names of two referees should reach the Registrar, The University, Leeds, 2, not later than April 12, 1957.

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FACTORY Manager experienced preserve manufacture, fruit, vegetable and fish canning requires new post. Former Research Chemist. Fully experienced in staff control, works costing and factory engineering. Would consider an overseas appointment.—Box B5495.

GRADUATE Chemist, 37, 16 years experience analysis research, production bakery products, flavourings, beverages, seeks change.—Box B5487.

TECHNICAL Administrative Position sought by man of 42; well educated and possessing varied experience of food processing methods and equipments, including materials handling and packaging; having good general knowledge of plant and property maintenance, building construction and works services; able to supervise production, improve methods, plan mechanised layouts, and progress installation and contract work; familiar with purchasing procedure also the handling of correspondence and negotiations. Ample scope for abilities and initiative desired, preferably with a smaller or medium-sized company having developments in view. U.K. or overseas.—Box B5504.

TOP EXECUTIVE

With drive, sound management experience and excellent administrative record, and "know how" on selling problems. Accustomed to dealing personally with chains and multiples. Interested in further top level appointment.—Box B5481.

FOREMAN Jam Boiler, 30 years experience Jam, Marmalade, Lemon Curd, Mincemeat, requires situation in or near London.—Box B5505.

BUSINESS OPPORTUNITIES

WANTED. Contracts/Sub-contracts for packing. Groceries, etc. Free warehousing and despatch.—Please reply in first instance to Box B5491.

NOTICE is hereby given that Tee-Pak Inc seeks leave to amend the Complete Specification of the Application for Letters Patent No. 764455 for an invention entitled *Shirring Sausage Casings*.

Particulars of the proposed amendments were set forth in the Official Journal (Patents), No. 3551 dated March 6, 1957.

Any person may give Notice of Opposition to the amendment by leaving Patents Form No. 36 at the Patent Office, 25, Southampton Buildings, London, W.C.2, on or before April 6, 1957.

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Comptroller-General.

SMALL Wholesale Grocery Business for sale, with small Complete Manufacturing Plant for jams and squashes; three vans, office accommodation adjoining premises. Ground floor area of factory, 2,270 sq. ft.; first floor, 1,760 sq. ft. Freehold property. Midlands area.—Box B5493.

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FRUIT and Vegetable Canning Business, freehold, near Evesham, for sale (modern house optional), about £9,000. Other items optional, at valuation.—Write, Wenn, Townsend and Co., 55, Cornmarket Street, Oxford.

FULL Steam in five minutes with B. and A. Electrode Boilers, used by British industries for twenty years. No boilerhouse, no flue, no attendant needed. The most compact and convenient steam raisers available, can go beside machines using the steam.—Write for Leaflet 125, Bastian and Allen Ltd., Ferndale Terrace, Harrow, Middlesex.

DE-GREASING and Cleaning Down. One man can do the work of five with B. and A. steam-cleaning-with-detergent equipment; ready for use from your own steam supply. "Speedylectric" high-efficiency steam lance; 30 ft. steam hose; 15 ft. detergent hose; £44 complete. Ideal for the Food industry.—Leaflet L.125 Hyzone Ltd., 2 Rosslyn Crescent, Harrow, Middlesex.

THE Proprietors of British Patent No. 700,029 for *Improvements in Mashers for Vegetables and the Like*, desire to enter into negotiations with a firm or firms for the sale of the patent or for the grant of licences thereunder. Further particulars may be obtained from Marks and Clerk, 57 and 58, Lincoln's Inn Fields, London, W.C.2.

The publishers have obtained a limited number of copies of FOOD MANUFACTURE covering August 1947, February, March, June, July, September, November and December of 1948, July, August, November and December 1949, February, March, May to December 1950, complete volume for 1951, February to November 1952, complete volume for 1953, May, August to December 1954, and the complete volume for 1955. Any readers requiring any or all of these copies, should send their order without delay to: *Food Manufacture*, Stratford House, 9, Eden Street, London, N.W.1.

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LITTLE-USED Compound Lard Plant, comprising: Votator by A. Johnson, Model S.51A, capacity 3,000 lb./hr., with small air compressor by Bristol Pneumatic Tool Co., Model 303V, driven by ½ h.p. motor mounted over vert. cylindrical air receiver. With Sterne ammonia compressor, No. 4628, 10 tons capacity, vee belt drive to flywheel from 25 h.p., S/R motor 400/3/50, with fan-cooled galvanised water cooling plant.

Chilling Plant by William Douglas and Sons Ltd. of Putney, comprising rotating chilling drum 5 ft. 1 in. face by approx. 2 ft. 9 in. diam., cored for cooling, gear driven by direct coupled 2 h.p. motor through Croft enclosed reduction gear. Drum supported on heavy c.i. side frames and complete with take-off knife. Included is a Nicol patent mechanical texturator by William Douglas with motor drive, circulating pump mounted on c.i. under-bed and Douglas Nicol atomiser direct coupled to motor on c.i. under-bed.

Ammonia Compressor by Douglas, type P.6, 6 in. by 6 in., 400 r.p.m., 130,000 B.T.U.s, vee belt drive to flywheel by 17 h.p. S/R motor, with all accessories including gauges, horizontal tubular condenser, evaporator, ammonia tank, connecting piping, water-cooled pumping set and tubular cooling water condenser.

Rotary belt-driven Chilling Machine, with roll approx. 5 ft. 1 in. long by 2 ft. 9 in. diam., cored for brine cooling. Take-off knife fitted.

Tot. encl. Churn or double-agitated Mixer by Henry Engle, jacketed body approx. 5 ft. 6 in. long by 4 ft. wide by 4 ft. 6 in. deep, two vert. agitators driven by S/R motor through flywheel enclosed gear.

New and unused portable Syrup Pump by Jobson and Beckwith. Rotan, Model RT. 32, 1¼ in. suction and delivery with gunmetal gears and stainless steel shaft, capacity 6 g.p.m. when pumping thick syrup. Drive by 1 h.p. motor through reduction gear mounted on channel under-bed on tubular framework with bogie wheels for portability.

20 cwt. Speedway portable dial-type Platform Weighing Machine by Vandome and Hart Ltd., visible dial scale graduated in 4 lb., quarters, and hundredweight divisions. Platform 4 ft. by 4 ft. galvanised clad.

Hand-operated hydraulic Fork Lift Truck by Montgomery Reid of Basingstoke, Wheel-about model, new 1955. Capacity 5 cwt. at 15 in. from heel of forks, and 6 cwt. at 10 in. from heel of forks. Mounted on three 10 in. by 2 in. solid rubber-tyred wheels.

Empire-type Wire Stitching Machine by Vickers-Armstrongs. Pedestal model, 16 in. throat, belt driven from electric motor.

Various steam jacketed Pans, Galvanised Tanks, etc.

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S.S. jac. Pans, 36 in. by 38 in., 60 w.p., and 36 in. by 30 in., 40 w.p. S.S. lined Autocalves, 6 ft. by 3 ft., 100 w.p. S.S. jac. cyl. Mixers, 39 in. by 32 in., and 40 in. by 24 in., 25 w.p., A.C. S.S. and chrome portable Stirrers, ¼, ½, 1 and 2 h.p. A.C. S.S. Mitchell portable Stirrer, 250 r.p.m., ½ h.p. S.S. Gardner Sifter/Mixer, 40 in. by 17 in. by 17 in. S.S. Sink Units, 6 ft. by 3 ft. by 10 in., and 1 ft. by 2 ft. by 1 ft. 3 in. Gardner *Jacketed* Sifter/Mixer, 40 in. by 16 in. by 16 in. "Z," fin and cyl. jac. and plain Mixers. Extruders, mincers, hot plates, hydros, pumps, disintegrators, crushers, refiners, conches, edge runners, ovens, retorts, boilers, steam and diesel engines, etc.—Harry H. Gardam and Co. Ltd.

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FOUR large Coffee Percolators, tinned copper mounted; three Storage Tanks; double head Filling Machine; also Centrifuge, for disposal. All practically new.—Enquiries Box B5497.

250 gal. stainless steel Tanks. 500 gal. s.s. Tank with agitator and motor. Benhil Butter and Margarine Packer. Stainless steel interior Milk Cooling or Cream Ripening Vat. Pasteuriser. Southall and Smith 2 lb. automatic Flour Weighing Machine. Mixers, kneaders, racks, provers, baking sheets, etc. Your enquiries welcomed.—Sorensen Bakery Equipment Ltd., 42, Raby Street, Manchester, 16. Tel.: Moss Side 2054 and 4054. 'Grams: Rahbek.

SMALL complete Jam Manufacturing Unit, consisting of electrode steam boiler, three boiling pans complete with all pipe lines and fittings, rotary filling table, labeller, pulping, cutting, mixing and whipping machines, scales, water softener pans, laboratory equipment. Can be seen any time. Also freehold factory and offices if required. Midlands area.—Box B5494.

FOR Sale: One Chisholm-Ryder Pea Viner, fixed beater assembly, usual accessories, fully reconditioned as new. One season's use only.—Box B5500.

ALBRO four-head Vacuum Liquid Filling Machine with stainless steel nozzles and float controlled levelling tank. Fitted with compressed air rise-and-fall bottle platforms and self-contained motorised vacuum pump. Previously used for filling squash, but suitable other liquids. Purdy World "Universal" semi-automatic Bottle Labelling Machine, motorised and adjusted to suit purchasers' bottles and labels. Both machines fully reconditioned and guaranteed.—Details from C. Skerman and Sons Ltd., 118, Putney Bridge Road, London, S.W.15. Tel.: Vandyke 2406.

BETH automatic All-round Can Labelling Machine. Fraser horizontal Steam Retort, 6 ft. by 3 ft. by 3 ft., with Drayton recording gear. I.M.C. ten-head Rotary Syruper with stainless steel parts. Mather and Platt heavy duty Vegetable Dicing Machine. B.C.H. 8 in. stainless steel Pulping and Sieving Machine. A.P.V. 10 in. stainless steel Pulping and Sieving Machine.—Details from C. Skerman and Sons Ltd., 118, Putney Bridge Road, London, S.W.15. Tel.: Vandyke 2406.

LANSING Bagnall Stillage Truck, battery operated and complete with four 24-volt batteries. Capacity 2 tons, with platform 3 ft. long by 18 in. wide. Almost new.—Apply Box B5502.

TOMLINSON steam heated Dryer—takes trays 20 in. by 36 in. Size 14 ft. by 7 ft. by 9 ft. approx., 40 lb. steam pressure. 7½ h.p. motor.—Box B5482.

STAINLESS. One 500-gal. stainless steel Vessel, water jacketed, electrically heated, with mixer, also one 80 gal. similar, without mixer. Both excellent condition. Seen Abietsan Manufacturing Co. Ltd., Concordia Works, Carmichael Road, London, S.E.25. Tel.: Addiscombe 2261.

FOR Sale at attractive prices: three 100-gal. stainless steel Fruit Pulping Steamers or Storage Tanks by B.C.H., one Sugar or Juice Filterpress and Receiver, one A.P.V. Rotary Jam Cooler, one Potato Peeler or Gooseberry Snibbers by B.C.H., motorised, one 100-gal. stainless steel Peel Cooker tipping by B.C.H., one 500-gal. rectangular stainless steel Tank, Alexander Werk Mixing Machine, fully motorised, with spare bowl. All excellent condition.—Box B5430.

SLONSAL Truck or Trolley to meet every requirement.—Write for list "C" to Williams and Dickinson Ltd., 27, John Adam Street, London, W.C.2.

ERICSON Pie Machine: Omatic type. Hand Pack Filler: Mather and Platt, Mark II. Bean Filler: Mather and Platt. Portable Cold Store: Approximately 6 ft. by 6 ft. by 6 ft. The above items of Plant are for sale, in good condition, with motors, and can be inspected at our premises during normal working hours. Further particulars on request.—Robert Wilson and Sons (Est. 1849) Ltd., Eglinton Park, Kilwinning, Ayrshire.

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MELANGEUR by Lehmann, 6 ft. diam., cast steel constr., with 10 in. by 6 in. side outlet. Twin granite rolls, 27 in. diam. by 13 in. face underdriven through crown wheel and pinion with bare shaft extension. Ploughs and scrapers mounted on crosshead.

Melangeur with granite bed, 4 ft. diam. by 6 in. deep. Steel sides, granite tapered rolls, 19 in. diam. Pulley drive.

Vert. five-roll Refining Mill by Buhler. Steel-cored rolls 31½ in. by 15 in. diam. Pulley drive.

Pomace Disintegrator and Blower by H. Beare. Blower capacity 6/8 tons pressed pomace per hr. Motorised 10 h.p., 400/3/50. Feed trough.

Twin cyl. steam-heated Drum Drier by H. Simon. Rolls 40 in. by 28 in. diam., 100 lb. w.p., running in plain bearings with steam inlet and condensate outlet. Doctor knife to each roll.

Two unused Vacuum Drying Ovens by Scott, ribbed c.i. constr., in bolted sections. Int. dimens. 6 ft. by 4 ft. 3 in. by 4 ft. 10 in., 16 steam coil shelves. Suitable 27/28 in. vacuum, fitted heavy dished door. With vacuum pump, condenser, etc.

Stainless steel Vacuum Mixer by Hardaker. Trough, 47 in. by 43 in. by 34 in. deep. Twin "Z" blades direct coupled to reduction gear. Domed cover, 24 in. deep with 2 in. vacuum conn. Electrically op. tilting.

Double Trough Mixer, 34 in. by 27 in. by 26 in. deep. Twin "Z" blades. Single spur gearing. Hand tilting, hinged cover. Motorised 400/3/50.

Double Trough Mixer by D. Thompson, m.s. trough, 35 in. by 45 in. by 39 in. deep. Twin "M" shaped blades, motorised 400/3/50. Separately motorised tilting.

Open top stainless steel Vessel, 200 gal., 60 in. by 36 in. by 30 in. deep. Side entry propeller agitator. Dull polished int.

80 gal. s.j., m.s. Boiling Pan with stainless steel lining. 32 in. diam. by 29 in., 1¼ in. run off. Hinged lid. Jacket 35 lb. w.p.

Four 40 gal. open top s.j. Boiling Pans by B.C.H., 25 in. diam. by 18 in., with pouring lip. Jacket suitable 60 lb. sq. in. w.p.

Walmer, Mark V, Chocolate Enrober by W. Denis Contacts. Water jacketed chocolate bath with immersion heater and 6 in. wide chain-type conveyor. Cooling section approx. 56 in. long, over 6 ft. centres. Flat belt conveyor 6 in. wide belt. Refrigeration unit cools tunnel, motorised 230/1/50.

Jelly Cutter by Brierley, table 19¾ in. by 19¼ in., adjustable daylight, at present 1⅛ in., 48 sections forming slabs 3¼ in. by 2¼ in.

New stainless steel Storage Vessels and Tanks, with capacities ranging from 8 gal. to 1,000 gal.

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STAINLESS Steel Tables required. Size: 4 ft. 6 in. by 2 ft. 6 in. by 3 ft. high.—Box B5496.

STONE Jars wanted to purchase. Any district.—Full particulars to T. Gunn (Rayleigh) Ltd., 206, London Road, Rayleigh, Essex. Tel.: Rayleigh 87.

DAMAGED or redundant stocks of food, residues or by-products in large or small quantities required.—Send your offers to Rotunda Foods Co., London Office: 50/52, Blandford Street, W.1. Tel.: Welbeck 8465.

SECOND-HAND PLANT FOR SALE

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CONFECTIONERY PLANT

MASTER Starch Mogul with usual starch sifting, brushing, tray, filling, mould stamping equipment, and complete with depositor and one set pump bars. Motorised 400/3/50.

Microfilm Continuous Sugar Cooker by Baker Perkins, for steam pressure 120 lb. sq. in. Motor driven. Output up to 600 lb. hr. depending on steam pressure, etc.

Drop Machine by Brierley, Collier and Hartley. Motor driven. With six sets rollers, 6½ in. by 4½ in. for orange and lemon slices, animals, round drop, berries and heart shapes.

Discharging to:

Three-tier Drop Cooling Machine by Bartleet. Motorised through reduction gear, with two motorised blowers.

Major Drop Machine by Hansella. Motorised 400/3/50, with two sets of sleeves for round drops.

Cut and Wrap Toffee Machine by Rose Bros. of Gainsborough, fully motorised, suitable wrapper 3½ in. by 2⅛ in., and block ⅝ in. by ⅝ in. by 1/16 in.

Premier Wrapping Machine by Rose Bros., fully motorised, suitable wrapper 2½ in. by ½ in. and block 1 in. by ½ in. by ½ in.

Two fully automatic Potato Crisp Filling Machines by Valco.

Standard Depositing Machine by Savy, Jean. Fully motorised Drop Sifting Machine by Lewer, with rotary screen, approx. 3 ft. 6 in. by 1 ft. 2 in. diam.

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HOMOGENISER, 100 gal./hr., with 5 h.p. motor and vee belt drive. " Miracle " Junior Grinding Mill, size 1B, with cyclone collector. " Gardner " Mixer, 60 in. by 20 in. by 20 in. deep, geared drive.—Welding's, Saxone Buildings, Tarleton Street, Liverpool, 1.

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Box numbers, 1s. extra.

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SECOND-HAND PLANT WANTED

REQUIRED: Potato Crisp Plant: Cookers, gas or oil fired; Slicer, automatic weigher; " Twistrapper " Salt Packing machine; automatic Heat Sealer; Centrifuge. Complete plant or separate items.—Full particulars to Box B5490.

WANTED: Second-hand Vacuum Drum Filter.—Reply to Box B5480.

WANTED: " Diana " heavy duty Vegetable Dicing Machine, Rotary Syruper.—Box B5484.

STAINLESS Steel Vats or Pots required. Sizes from 25 to 250 gal.—Denton Edwards Paints Ltd., Abbey Road, Barking, Essex. Tel.: RIPpleway 3871.

CONTINUOUS Freezing Plant wanted, either Creamery Package or Cherry Burrell.—Particulars to Box B5387.

CREAMERY Package or Cherry Burrell Pasteurising and Homogenising Plant required. —Box B5388.

WANTED

Diesel engines. Diesel generator sets. Any type surplus diesel plant. Immediate cash. We clear if required. P. R. Lowe and Co., 34a Rainham Road, London, N.W.10. Tel.: LAD 4005.

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FOR Sale: Monosodium Ortho Phosphate (I.C.I.) approximately 7 tons in 56 lb. metal drums. Any reasonable offer considered for all or part consignment.—Box B5489.

DRIED Mushrooms, frequent shipments, competitive prices.—Mushpro Ltd., 2a, Ashdown Street, London, N.W.5.

HARDWOOD Offcuts (miscellaneous) available at realistic prices.—Apply C. F. Anderson and Son Ltd., 117, London Road, Mitcham, or telephone Mitcham 2357.

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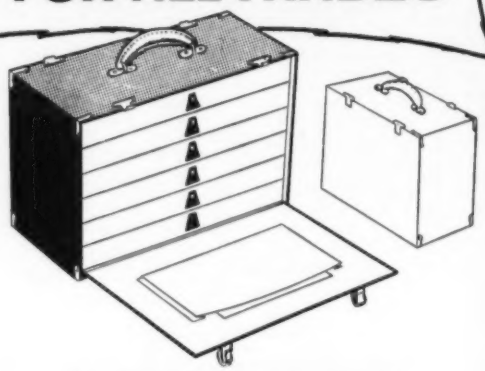

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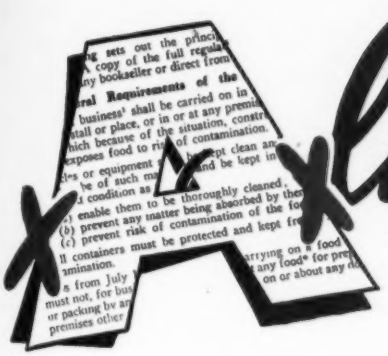

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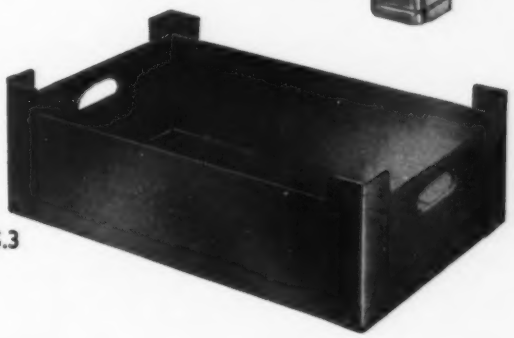

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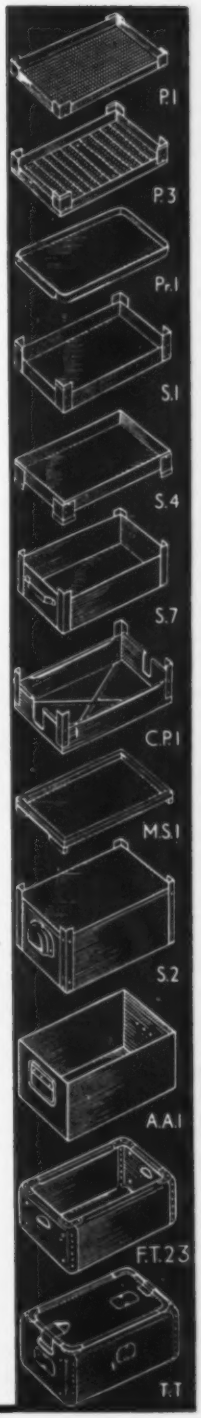

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